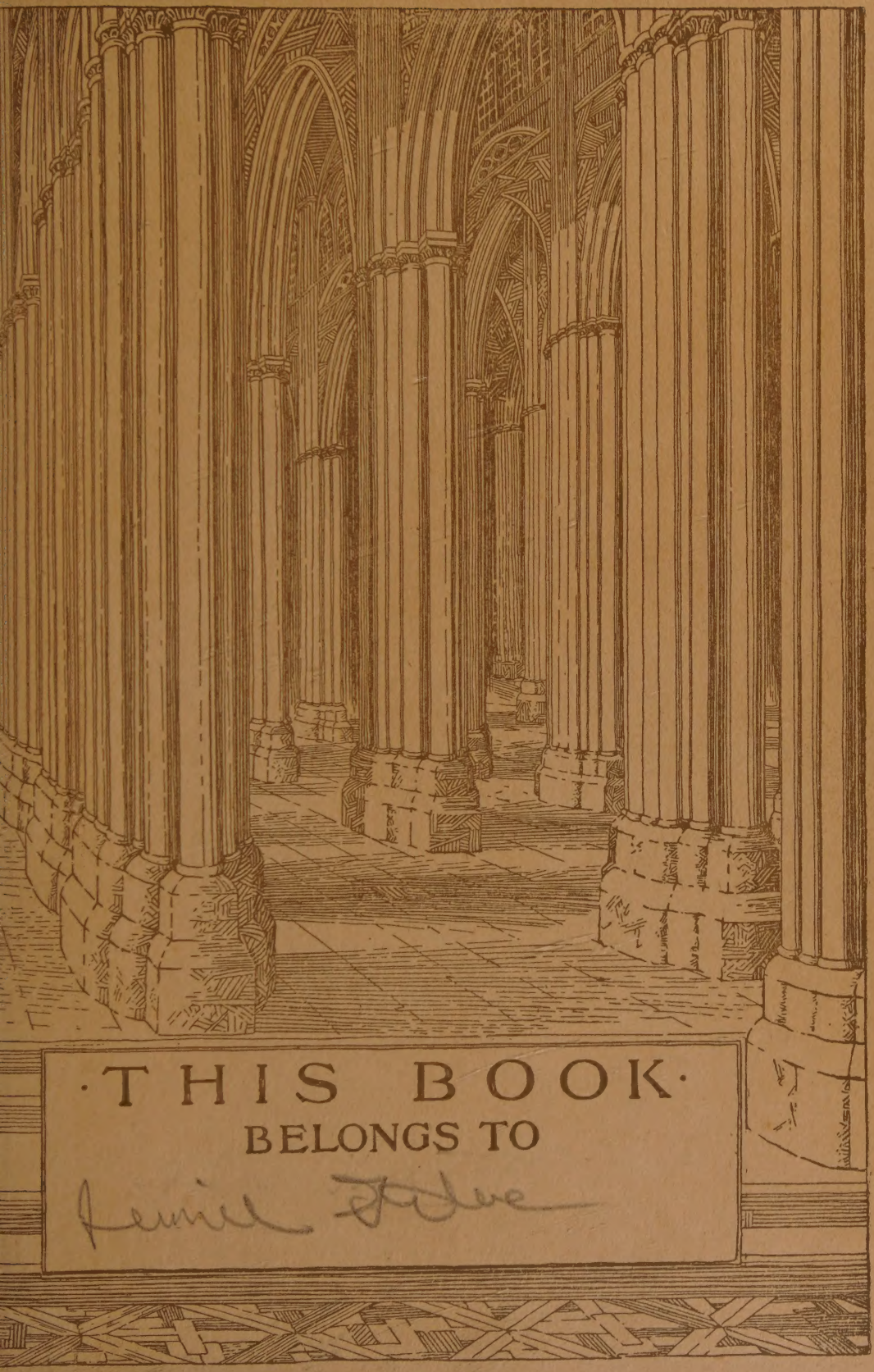
·THIS BOOK·
BELONGS TO

THE NEW

STUDENT'S REFERENCE WORK

FOR

TEACHERS, STUDENTS AND FAMILIES

EDITED BY
CHANDLER B. BEACH, A.M.

ASSOCIATE EDITOR
FRANK MORTON McMURRY, PH.D.

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THE STUDENT'S CYCLOPAEDIA

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Plin'y the Older (GAIUS PLINIUS SECUNDUS), so called to distinguish him from his nephew of the same name, was born either at Novum Comum (the modern Como) or at Verona in 23 A. D. His education was carried on at Rome under every advantage that wealth could furnish, and at 23 he entered the army, serving on the staff of L. Pomponius Secundus, then conducting a campaign in Germany. Returning to Rome in 52 he practiced at the bar for a short time, and then withdrew to Como, where, during the greater part of the reign of Nero, he devoted himself to reading and authorship. By incessant and lifelong application he amassed materials enough to fill the 160 volumes of manuscript which he bequeathed to his nephew. His *Historia Naturalis*, in 37 books, is the only one of his works that has come down to us. Under that title the ancients classified everything of natural origin, not only botany, zoology and mineralogy, but geography and astronomy. Pliny, however, extends this list by comments on human inventions and institutions, and even devotes two books to a history of fine art. Pliny was in command of the Roman fleet off Misenum when the great eruption of Vesuvius occurred in 79 A. D. Eager to witness the phenomenon as closely as possible, he landed at Stabiæ, but had not gone far toward the mountain when he was suffocated by the stifling vapors and cinders.

Pliny the Young'er (GAIUS PLINIUS CÆCILIUS SECUNDUS), was born at Novum Comum (Como), Italy, in 62 A. D. His education, after his tenth year when his father died, was conducted by his mother, Pliny the Elder, his uncle, and Virginius Rufus, his tutor. He early manifested the highest literary talents, and made such progress that in a few years he was known as one of the most accomplished men of his time. When only 18 he began to plead in the Forum; and at 25, the earliest possible age, he was emperor's quæstor, then prætor, and in 100 consul, when he wrote his panegyric on Emperor Trajan. He was twice married, but died without issue, in what year is not known. It is to his letters that Pliny owes his place in literature. An avowed imitator of Cicero, he caught much of the charm of his model, while his style is hardly, if at all, inferior. From Pliny we derive our impressions of the public and private life of the upper classes in the 1st century; and from his correspondence with Trajan we get our clearest knowledge of the feeling with which even one of the most enlightened Romans regarded the then obscure sect of Christians. Pliny consulted the emperor as to what could be done to stop the spread of what he called "a depraved and extravagant superstition," and in reply Trajan recommended that Christians should not be sought out on suspicion, but that, if accused and convicted of holding that faith, they should be punished. Accusations unsupported by proof were not to be received, while suspected persons were to have an opportunity of clearing themselves by offering prayers to the Roman gods. This official correspondence ended in 113, and Pliny then disappears from our view.

Plover (*plŭv'er*), a shore-bird with long wings and slender legs, related to the snipe;

GOLDEN PLOVER

distinguished by small or medium size, plump bodies and short bills. Their food, chiefly animal, is picked up from the surface of the ground. They are swift in running and in flight, utter a mellow whistle, are gregarious save in the nesting season. Not shy, they are birds well-known to man. The lapwing of Europe is a plover. There are about 100 species, but only six are found in eastern North America. They live mostly near the water, but some forms visit uplands and dry fields. The killdeer is the one most generally known. It and the piping plover are the only ones that nest in the eastern United States. It is about 10½ inches long, with the upper parts brownish-gray and the tail rusty. The white breast is crossed by two dark bands which are the best field-marks. The ring-necked plover looks like a small killdeer. It is about 6¾ inches long, with a single black bar across the breast. It visits our shores on its way north in May, and, again, in August and September on its journey south. It is so small it is not shot as game. Besides the two mentioned, those less frequently seen in eastern North America are the golden, piping, black-breasted and Wilson plovers. Though furnishing but a morsel of food, more than one of the smaller plovers fall victims to the pot-hunter. The fine game-birds, the black-breasted and the golden plover, in

recent years have been practically exterminated in haunts where once abounding.

Plow, an instrument for breaking up and turning over the soil preparatory to the raising of a crop. The plow is mentioned in the Old Testament as having been used at a very early period; and Dr. E. B. Tylor, in his *Anthropology*, has clearly shown how it arose by gradual improvement from the hoe as that did from the pick or hatchet. The modern plow, with its moldboard for turning over the soil, was invented in the Netherlands a little more than two centuries since; but it has been greatly improved in that time. England took the lead in this improvement, followed by Scotland, in which country the chief inventors and improvers were Small (the inventor of the Scotch swing-plow), Wilkie, Gray and Sellar. In the American sulky-plow the weight of the implement is supported by wheels, thus decreasing friction and enabling the plowman to ride on the plow instead of walking. The double Michigan plow has a small plow on the beam in front of the other. The small plow pares off the surface of the soil and throws it into the previous furrow, and the large one completely buries it under a heavy furrowslice. Reversible or sidehill plows have the share and moldboard so they can be easily changed from one side to the other. Steam-plowing was first introduced in England in 1832. On the great farms of the American and Canadian prairies plows are set in gangs turning six or more furrows, and driven by traction steam-engines. Plowing can also, if the soil be soft, be done with gangs of rotary plows. These have cupped disks set at an angle and so weighted as to sink into the soil. With the use of these plows a few men accomplish great results. An engine is sometimes made to draw a line of plows, behind which is hitched a line of harrows, while behind these come a seed-drill and rakes.

PLUCKER TUBE

Pluck'er Tube, a long, slender, glass tube, first made by Geissler of Bonn (1858) on the suggestion of Plücker, for the examination of the spectra of gases. The original form of these tubes is shown in the accompanying figure. At each end a platinum wire is sealed in; and, when these wires are connected to the terminals of an induction coil, the electric discharge brings the gas to incandescence, so that its spectrum is then ready for examination by the spectroscope. An improved form of spectrum tube is one in which the capillary portion is placed "end on" instead of "side on" before the slit of the spectroscope. See Kayser's *Handbook of Spectroscopy* (in German).

Plum, certain species of the genus *Prunus* to which also belong the peaches and cherries. In the plum the flowers occur in umbel-like clusters and appear either before or with leaves. The fruit is a drupe or stone fruit, as in the case of peaches and cherries. The most common plum of cultivation is *P. domestica*, which probably is of Asiatic origin. Its fruits have been made to vary exceedingly as to shape and flavor. The common wild plum of the United States is *P. Americana*, with dull yellow fruit, splashed with spots of red, which is also under cultivation. The wild goose-plum is *P. hortulana*, with many varieties under cultivation. It is found wild in the Mississippi valley.

Plumb'ing, the art of casting and working in lead or other metals and applying them to various purposes connected with buildings, in its broadest sense including pipes and fixtures used to supply water, gas and heat and also the pipes used to remove liquid wastes. A more restricted and now common use of the term includes only water-supply and house-drainage systems, the providing of pipes and fixtures for gas and for heat being called gas-fitting and steam-fitting respectively. The word is derived from the Latin word meaning lead, this being the metal used in Rome and other ancient cities for purposes of water-supply pipes where the pressure was too great for pipes of earthenware. There has been a tremendous improvement in plumbing in recent years, and there is a rapidly growing appreciation of its importance to health as well as to comfort and convenience. Every city of to-day is provided with a system of water-works, and no house is complete if not provided with hot and cold water, with such fixtures as bath, basins, faucets, sinks and other appliances. In America, even in homes in rural districts, such provisions are now quite generally made, often at very heavy extra expense. It is known that some waters attack and decompose lead, giving rise to lead-poisoning, and in highly expensive plumbing copper is commonly employed for hot-water piping.

Plumule (*plū'mūl*) (in plants), the first terminal bud which appears in the embryos of most dicotyledons. Sometimes it is very minute, in other cases it contains a number of the early leaves of the plant, and in any case it develops the shoot. See EMBRYO.

Plu'tarch, a prolific author of the first century, was born at Chæronea in Bœotia, in 46 A. D. Scarcely anything is known of his personal history, except that he commenced to study at Athens under the academic philosopher Ammonius in 66, the year of Emperor Nero's progress through

Greece. He also spent several years at Rome, where he enjoyed the friendship of public officers and men of learning, besides devoting himself to a course of study and giving lectures on philosophy. Life at Rome not being altogether to his taste, he returned to Chæronea, where he became a magistrate, and died at 70 or 75 in the reign of Emperor Hadrian.

The work of Plutarch for which he is most noted is his *Parallel Lives*, in which he gives the life of some distinguished Greek and some distinguished Roman, and then draws a detailed comparison between them, although some authorities consider these comparisons spurious. These lives, 44 in number, as arranged in pairs, include Demosthenes and Cicero; Aristides and Cato the Elder; Pericles and Fabius Maximus; Alexander and Cæsar; Agesilaus and Pompey; Pyrrhus and Marius; and Alcibiades and Coriolanus among others. Plutarch was not a profound thinker, but he was a man of rare gifts, and adheres throughout to his professed purposes, which was portraiture of character. For this reason his *Lives* will remain the book of all ages, so that Plutarch may almost be called the interpreter of Greece and Rome to modern times. Emerson called him "the serenest and stablest figure in the world of letters." Shakspere was greatly indebted to Plutarch. See A. H. Clough's version of *Plutarch's Lives*.

Plu'to, the surname of Hades, in Grecian mythology is the third son of Cronos and Rhea and the brother of Zeus and Poseidon. To him belongs the sovereignty of the under world — the realm of darkness and ghostly shades — where he sits enthroned as a "subterranean Zeus," and rules the spirits of the dead. His dwelling place, however, is not far from the earth. Pluto is inexorable in disposition, not to be moved by prayers or flatteries, and is borne on a car drawn by four black steeds, whom he guides with golden reins. In Homer, Hades means a person, not a place; and the poet does not divide the realm of the shades into two distinct regions. All the souls of the dead — good and bad alike — mingle together. At a later day the kingdom of the dead was divided into Elysium, the abode of the good, and Tartarus, the abode of the wicked. This change also exercised an important influence on the ancients' conception of Pluto. The ruler of the underworld not only acquired additional power and majesty, but was regarded as a beneficent deity, who held the treasures of the earth (whence his name Pluto, from *plutein*, to be rich) in his hands, and caused the fruits and abundance of the earth to spring from under the ground. Hence in later times men prayed to him before digging for the wealth hid in the bowels of the earth.

Plym'outh Company, The, was incorporated in 1606 by a company of English merchants belonging to Plymouth and Bristol for the purpose of trade, especially with North Virginia; James I granted it a charter and a portion of territory lying between Passamaquoddy Bay and Long Island, so that it became a serious competitor with the London Company. In 1620 the Plymouth Company was reorganized. It had been the North Virginia Company; henceforth it was the New England Company. Under its auspices the Pilgrim Fathers (*q. v.*) obtained their patent for a settlement in so-called Virginia.

Plymouth, an English seaport on the northern shore of Plymouth Sound, 240 miles from London and 125 from Bristol. It was the favorite port of Edward the Black Prince, the chief rendezvous of Drake, Hawkins, Grenville, Raleigh and their fellows, and the final port of departure of the Pilgrim Fathers in the *Mayflower*. In the contest of Charles I with Parliament it sided with the latter, and after enduring a series of sieges and blockades, extending over four years, shared with Hull the honor of saving the parliamentary cause. In the reign of James II it was the first town to declare for the Prince of Orange (William III), and in the great French war it rivaled Portsmouth in naval activities. Population 112,042.

Plymouth, Mass., on Plymouth Bay, 37 miles by rail from Boston, is famous as the landing place of the Pilgrim Fathers, Dec. 21, 1620. Plymouth Rock, on which they landed, is a granite bowlder at the water's edge and is covered by a handsome granite canopy. The national monument, on a hill overlooking the landing-place, is 81 feet in height, and is surmounted by a central figure of Faith, with four immense stone figures, representing Morality, Education, Freedom and Law, around the base. In Pilgrim Hall are preserved many relics of the first settlement. The town is popular as a summer resort. It has a variety of manufactures—duck, cordage, woolen goods, tacks, wire nails and electrical supplies. Population, 14,000. See MAYFLOWER.

Plymouth, Pa., a borough on the Susquehanna, county-seat of Luzerne County, four miles from Wilkes-Barre, and in the center of the anthracite mining activities. It is served by the Delaware, Lackawanna and Western, the Delaware and Hartford and the Jersey Central which enters for coal-trade. It has public and high schools, churches, banks and other civic institutions. Its chief industry is the shipping and handling of coal, as it is in communication, both by water and rail, with Scranton and the mines of Wilkes-Barre. Among other occupations are hoisery, silk and mining-drill mills and a paper and wooden box factory. It is united by electric lines to

other Wyoming-Valley towns, and claims the distinction of sending the first coal to market. Population 16,996.

Plymouth Sound, on the southwest of Devonshire, England, is a deep inlet of the English Channel into which the Tamar falls from the west and the River Plym from the east. In 1812 was begun the construction of Plymouth Breakwater, an insulated mole of stones, a mile in length, stretching across the middle of the sound and thoroughly protecting all vessels anchored within. It was not fully completed till 1841, and cost nearly $7,500,000. Plymouth Sound has been said to rival the Bay of Naples in beauty.

Pneumatics (*nû-măt'ĭks*), is that part of physics which treats of the properties of gases. It has to do with investigating their weight, pressure, elasticity, condensation etc. and with a large number of machines and appliances based upon the behavior of gases under pressure. Few studies in science have yielded more important results than has the study of the nature and properties of gases. Almost the entire structure of modern chemistry rests upon our knowledge of gases; and by the study of gases physicists have been led to a clear and simple explanation of the phenomena of heat and many other phenomena forming important chapters in modern physics. The applied sciences, too, owe much to our knowledge of gases. A knowledge of the properties of compressed air has led to many mechanical devices of the greatest economic value. A large variety of portable tools, percussion and rotary; the air-gun; the air-pump; and the diving-bell owe their origin to a knowledge of gases. Compressed air is used extensively in building bridge-piers, tunnels and other foundations, where water and quicksand are to be excluded. It has been used also for motor-power for street-railways, though not very economically. But for the transmission of mail and small parcels at high speed compressed air has been used to very great advantage, and its use in this direction is only beginning to be developed. The first application of pneumatic transmission to the conveying of mail and parcels was made in London in 1863, but the United States Government decided to give the system a trial only in 1892. The Western Union Telegraph Company has used it for many years, and it has been largely employed in commercial establishments for conveying change and goods. But it has not reached the development in this direction in the United States that it has in Europe. Its use in the United States for mechanical appliances, as carpenters', machinists' and other tools, is more developed.

Pneumatic Tires were first invented by R. W. Thompson, an English civil engineer, in 1843, for use on road-machines. In the United States a patent was granted in 1847. But it was not until these tires came to be used for bicycles that they acquired real importance. In 1889 Dr. J. B. Dunlop fitted his son's bicycle with a tire of rubber hose, with such success that a patent was obtained, although this patent covered certain details rather than the broad principle of the pneumatic tire. A patent of Mr. Tillinghast of Rhode Island led to the universal use of the pneumatic tire on bicycles within five or six years. The pneumatic tire is also employed universally on automobiles and widely for other vehicles. Its great advantage is that it sinks into small depressions instead of jumping over them, thus reducing both the jolt and the friction of motion and increasing speed. Its only defect is the liability to puncture, when the tire becomes useless until patched or renewed.

Pneumatic Tool, a mechanical tool operated by compressed air. In tunneling and mining pneumatic drills are used, and similar tools are used for stone-carving. The power is applied by pressure of compressed air against a piston in a cylinder, and by a suitable automatic valve the blow can be repeated several times a minute. Pneumatic riveting-machines and hoists are two other pneumatic tools used very extensively. Pneumatic tools are generally simple to operate, but not so economical as either steam or electricity.

Pneumatic Tube, a tube or pipe in which packages and written messages are sent by the use of compressed air or by normal atmospheric pressure acting against a vacuum. The packages are inclosed in carriers of proper shape or size to go into the tube and are forced along the tube by pressure behind them. Pneumatic dispatch is used very extensively in large stores, in connection with cash-systems. In newspaper and telegraph offices it is used to transmit messages. In New York City, London and several other large cities it is used to send the mails between the main postoffice, the substations and the railroad stations. In Berlin and several continental cities it has been used for rapid delivery of local letters in connection with the postoffice. Lead-pipes are ordinarily used for messages, but steel pipes are used for large packages. See PNEUMATICS.

Po, the largest river of Italy, rises on Monte Viso, one of the Cottian Alps, at an altitude of 6,000 feet, close to the French frontier. About 60 miles from its mouth, above Ferrara, it begins to form its delta, 60 miles wide from north to south. The delta is rapidly growing in area; Ravenna, once a city on the seashore, is now four miles inland. The entire length of the Po is 360 miles, and it drains an area of 28,900 square miles. It has always been a difficult river to cross on account of its width and

the great volume of its waters; hence the commercial importance of such places as Piacenza and Turin, where there are the easiest fords.

Po'cahon'tas, daughter of the Indian chief Powhatan, was born about 1595. Her name has become famous for the part she is said to have played in saving the life of Captain John Smith in 1607. During one of Smith's exploring expeditions in Virginia he was taken prisoner by Powhatan, and his head laid on a log preparatory to having his brains beaten out by a club. At this juncture Pocahontas rushed between Smith and her father, and, placing her head on that of Smith, persuaded Powhatan to spare his life. Pocahontas married an Englishman named John Rolfe in 1614, and went to England with her husband two years later. After remaining in that country six or seven months, she embarked for Virginia, and died off Gravesend in March 1617.

Pod, the general name applied to dry and dehiscent fruits. A pod may be made up of one or more carpels. It is also used as the special name of a dry elongated fruit which consists of a single carpel, as in peas and beans. See FRUIT.

Poe (*pō*), **Edgar Allan,** an American poet, was born at Boston, Jan. 19, 1809. His father and mother both dying in his infancy, he was adopted by John Allan, a rich and childless merchant of Richmond. In 1826 he entered the University of Virginia at Charlottesville, but, although a brilliant and successful student, he quitted the institution at the end of a year, deeply involved in debt through his passion for gaming. After remaining at home a year or more he expressed a desire to enter the military profession, and Mr. Allan secured his appointment as a cadet at West Point. Here he drank to excess and so neglected his duties that he was court-martialed and dismissed in 1831. He returned to Richmond and was kindly received by his foster-father, who had become a widower and married a second time. It is related that Poe's conduct toward Mrs. Allan was such that he had to be driven from the house. Whether this were the case or not, when Mr. Allan died in 1834, Poe was not mentioned in his will. Thus thrown upon his own resources for a livelihood, Poe devoted himself to literature. In 1833 the publisher of a Baltimore magazine offered prizes of $100 each for the best poem and the best story, both of which were won by Poe. About the same time he secured employment in connection with *The Southern Literary Messenger* at Richmond, and while there married his cousin, Virginia Clem, a beautiful and saintly girl only 14 years old, who died in 1848. In 1837 Poe moved to New York City, where he spent the next few years in various kinds of literary labor, 1845 being marked by the appearance of his world-famous poem, *The Raven* (*q. v.*). In 1849 he visited Richmond. On the 4th of October he left Richmond for Baltimore, and a few hours after reaching the latter city he was found insensible on the street and taken to an hospital, where he died two or three days later (Oct. 7, 1849). In all the sad records of genius there is hardly any such dark and disastrous career as that of Poe. But whatever may be said of his morals, his genius must be conceded to be of a high order. Small in quantity and limited in range as is his poetry, there is that in it which gives it a high place in American literature and will cause it to be read and admired by many generations. See *Lives of Poe* by Ingram, Gill, Woodberry and S. H. Whitman, and Stedman's *Poets of America.*

Po'etry. Poetry stands between prose and music, partaking somewhat of the nature of each. In the representation of particular things or the expression of definite thoughts it is nearer to prose. In general emotional suggestion it is nearer to music. Its material may be whatever is selected by the poet from the life of nature and of man. But the poet's conscious selection is also unconsciously influenced by his race, nation, generation and circumstances; by his peculiar traits of observation, appreciation, understanding, emotion and imagination; and by his personal ideals, purpose and impulse. Thus, as a product, poetry combines the most individual with the most general characteristics.

The particular manner of expression which we associate with poetry is the result of a selection since the earliest times of whatever has proved most generally pleasing in form. Even though a poet be highly gifted with beauty of utterance, he is not likely to depart greatly from this accumulated judgment of the past with regard to structure and style. The peculiarities which characterize poetic expression lie chiefly in vocabulary, meter and structure or general arrangement. The vocabulary selected by poetry is usually more heightened or emotional than that of prose. It often is more concise, and, in addition, for the sake of picturesqueness and intensity, it consciously seeks variations from the ordinary choice and arrangement of words, by the use of tropes, as the simile and metaphor, and of figures, as repetition and contrast. In meter, poetry makes use of the rhythm attained by the arrangement of accents so that they recur regularly, from three to six accents being usually found in each verse or line. For convenience of study the usual groupings of accented syllables with the unaccented syllables which immediately accompany them are considered as poetic feet or measures. The commonest feet in modern English verse are the iambus, the trochee, the anapest and the dactyl. The most frequently used is the *iambus,*

in which an unaccented syllable is followed by one which is accented. This is illustrated in the following six-accented or hexameter line: "When balmy showers refresh the mower's soil." The *trochee* is the reverse of the iambus, having an accented syllable followed by one which is unaccented, as in the following five-accented or pentameter line: "Spake full well in language quaint and olden." The *anapest* is like the iambus, but has two unaccented syllables preceding one which is accented, as in the following four-accented or tetrameter line: "There the warrior lay stretched in the midst of his pride." The *dactyl* is the reverse of the anapest, being like the trochee, but having two unaccented syllables followed by one which is accented. This is illustrated in the following three-accented or trimeter line: "Here we securely may hide us all." Stanzas are composed of groups of such lines, bound together by rime or a similarity in the sounds with which they end. Stanzas are not always used, and rime is not absolutely necessary, but rhythm is essential to poetry. Blank verse or unrhymed iambic pentameter, is the favorite verse of Shakspere and Milton. The melody is often increased by the careful use of pauses; by alliteration or the repetition of the sounds with which words begin; by assonance or the repetition of the same arrangement of vowels in two or more words; and by onomatopœia or a close suiting of the sound to the sense.

The most characteristic forms of poetic structure are the lyric, the epic and the drama.

Lyric Poetry, which is much the more common, had its origin in singing, and still possesses many qualities which associate it with music. It usually deals in a personal and individual way with interests which are definite and present and usually of a subjective and emotional nature. It is best when spontaneous, sincere and brief. Its many varieties have grown from variations in form suited to its wide range of subjects. It may deal with religion, as in Whittier's *The Eternal Goodness*; with patriotism, as in Lowell's *Commemoration Ode;* with affection, as in Poe's *Annabel Lee;* with nature, as in Bryant's *Thanatopsis;* with grief, as in Emerson's *Threnody;* with reflection, as in Longfellow's *My Lost Youth;* with social life, as in Holmes's *The Boys*. There also are numerous fixed forms of the lyric, the chief of these being the sonnet, with fourteen lines always and a specified arrangement of rimes.

The *epic*, which probably was the earliest form of poetry, had its origin in recitation. As contrasted with the lyric, it is impersonal in attitude and general in interest, dealing usually with objective events of a national or racial character, especially as they are represented in the experiences of a typical hero. In form it is long, simple and regular. The Greek *Iliad* and *Odyssey*, the Anglo-Saxon *Beowulf*, the medieval romances of King Arthur and a few modern poems like Longfellow's *Hiawatha* are examples. Related forms are the allegory, like Dante's *Divine Comedy;* the idyl, like Whittier's *Snow-Bound;* and the ballad, as in the Robin Hood cycle.

The *drama*, having its origin in acting, unites many of the characteristics of the epic and of the lyric. It presents the past as present, gives outward form to inward spirit, and embodies general characteristics of human nature in its characters and fundamental laws of cause and effect in its plots. Both the ancient and the modern drama began as religious ceremonies, but by the time of Shakspere the drama had become wholly secular. In general, each play either is a tragedy, in which the hero is overcome through his fault or error or fate; or is a comedy, in which the hero triumphs. There is a great distinction between the poetic drama and that which is merely intended for the stage, but even the latter suggests the introduction, complication, climax, solution and conclusion which are the characteristic divisions of almost every work of literature.

It will be evident, in conclusion, that poetry, in addition to delighting the reader with a "beauty [which] is its own excuse for being," may be a means of cultivating fine emotion, informing the mind, developing the intellect, and training and stimulating the will.

To select the best out of the great mass that has been and is being written is not difficult after one has experienced the pleasure and profit to be derived from familiarity with even one example of such poetry as the world has long judged great. The thorough enjoyment of a drama by Shakspere, a lyric by Wordsworth or one of Tennyson's *Idyls of the King* is an experience which enables the student to recognize excellence in any poetry he may meet, and will make the reading of any but the excellent a disappointment. In the study of any poem one may well attend to the nature, source and handling of the material; to the mood of the poet and its development; the essential theme, its treatment and conclusion; the diction, meter, form; and any other notable characteristics. It always is interesting and valuable to become familiar with enough examples of the work of a single author to acquire an impression of the general character of his product, his personal attitude toward life and his individual suggestion for the solution of its problems.

Pog'gendorff, Johann Christian, an eminent German physicist, was born at Hamburg, Dec. 29, 1796; and died at Berlin, Jan. 2, 1877. He is best known, perhaps, in his capacity as editor of the great Ger-

man periodical *Annals of Physics and Chemistry.*

Poincare, Raymond (1860). Few men have ever devoted to public service a broader mental training and equipment than Raymond Poincare, President of France (1913-). A graduate of the University of Paris, he was trained for the law, served for a time in the Department of Agriculture, distinguished himself as an economist in the Chamber, served successively as Minister of Education and Finance and in 1913 was elected President. During all his public service up to this time, he continued to practice at the bar, and found time to publish a number of brilliant essays on literary, scientific and political subjects.

Point'er. See DOG.

Poi'son-Ivy. See POISONOUS PLANTS.

Poi'sonous Plants. Of the number found in the United States mention may be made of poison ivy, poison sumac, poison hemlock, water hemlock, pokeweed, corn cockle, black cherry, red buckeye, horse chestnut, laurel and jimson weed.

Poison-Ivy, a climbing or trailing shrub (sometimes erect), with variable three-foliate leaves, aërial rootlets and greenish flowers, appearing in May and June. The smooth, waxy fruit often remains on the plant until late in winter. The leaves often resemble those of the box-elder, as in the figure; but their margin is not seldom almost entire. They differ from those of the Virginia creeper in having only three leaflets instead of five. Poison-ivy grows everywhere in open brush, in ravines and on the borders of woods, and it is spread along roadsides and cultivated fields from seeds carried by crows, woodpeckers and other birds that feed upon its fruit in winter. The plant occurs abundantly throughout the United States as far as eastern Texas, eastern Kansas and Minnesota and in greater or less abundance throughout the less arid region of the west, with the exception of California, where it appears to be entirely replaced by *Rhus diversiloba.*

POISON-IVY

Poison-Oak plant differs from poison-ivy mainly in the character of its leaflets, which are somewhat thicker and smaller, more nearly elliptical and less sharply lobed. Their similarity to the leaves of the western oaks gives the plant its common name. The poison-oak thrives best on cool, westward mountain slopes and in ravines, but is quite generally spread throughout the Pacific coast from Lower California and Arizona to British America. It does not, however, frequent the higher mountains.

POISON-OAK

Poison-Sumac is an absorbent shrub six to 30 feet high, with long, pinnate leaves, having from seven to 13 entire leaflets. The wood has a faint, sulphurous odor, which, together with the leaf scars, which are very prominent, enables one to distinguish the plant from other shrubbery in winter. It grows in swamps and in damp woods from Florida to Canada and westward to Louisiana. Poison-ivy, poison-oak and poison-sumac each produce about the same effect on the human skin.

Pokeweed shoots are often eaten for greens in the spring, but great care must be taken in so using the plant, as the root is very poisonous. The berries are greatly enjoyed by birds, though sometimes cases of poison have been traced to the fruit. It is a fine, sturdy plant, grows from five to ten feet high, the large smooth leaves are on long petioles, white and pink blossoms may be seen from July to September, the fruit is a generous bunch of juicy purple berries. The range of the plant is general, it grows on the outside border of fields.

Corn-Cockle grows in grain fields, bears blossoms of purple-red, adds no little to the beauty of a field but is a grievous pest. Its black seeds mix with the seeds of the grain; occasionally a low-grade flour will show some of the black of the corn-cockle's seed-coats and cases of poison have resulted from the presence of corn-cockle in flour. Such flour has a peculiar odor when moistened. Corn-cockle stem is stout and many-branching; its leaves are pale green and hairy, the flower is terminal and solitary and may be seen from July to September.

Black Cherry seeds and leaves (see CHERRY) may contain enough prussic acid to cause poisoning; kernels should not be eaten; fresh-cut branches should not be put where cattle can get at them. Seeds, fresh leaves and twigs of red buckeye and common horse-chestnut contain poison. The leaves of evergreen laurels have killed animals eating them. Jimson weed (Jamestown weed, thorn-apple etc.) getting into the hay

of cattle proves disastrous, and poisoning has resulted from children handling flowers and eating seeds. It is a weed of bushy habit; it grows rank in waste places; the stem is from two to five feet high; the leaves are large and flaccid, the showy flowers, white or purple in color, in shape resemble the morning glory, but have a heavy, unpleasant odor. The purple variety is especially poisonous. The weeds belong to the nightshade family. It grows along roadsides, in pastures and in gardens. See Chestnut's *Thirty Poisonous Plants of the United States*, Farmers' Bulletin 86, U. S. Department of Agriculture.

JIMSON WEED

Poisons. A poison may be defined as "any substance or matter which, when introduced into the body in any way, can destroy life by its own inherent qualities without acting mechanically." Poisons are sometimes classified according to their source as mineral, vegetable and animal; or, more generally, according to their action as *irritants*, *narcotics* and *narcotic irritants*. The irritants, when taken in ordinary doses, produce intense vomiting and purging and severe abdominal pain. They act directly upon the stomach and intestines, which they inflame and frequently corrode. The narcotics act specially on the brain and spinal cord. Among their most common symptoms are headache, giddiness, obscurity of sight, stupor, loss of muscular power, convulsions and finally complete coma. They have no acrid, burning taste, and, except a slight fullness of the cerebral vessels, they leave no clearly marked post-mortem appearance. The narcotico-irritants have a mixed action. At varying periods after they have been swallowed they produce stupor, coma, paralysis and convulsions, owing to their effect on the brain and spinal marrow. As examples of irritant poisons we may mention sulphuric, nitric and oxalic acids (in doses of half an ounce or more), carbolic acid, arsenic, corrosive sublimate, blue vitriol, lunar caustic and chloride of antimony. Among the narcotics are opium, belladonna, alcohol, ether, India hemp, chloral and chloroform. The narcotico-irritants include prussic acid, strychnine, *nux vomica*, hemlock, aconite and nicotine (the active principle of tobacco). The evils resulting from the use of alcohol in its various forms have caused laws restricting or prohibiting the sale of intoxicating liquors to be passed in most of the states of the Union; and, as a preventive of the evils resulting both from alcohol and tobacco nearly all the states have laws providing for instruction in the public schools as to the effect of narcotics upon the brain and nervous system.

Poisson (*pwä'sôn'*), **Simeon Denis,** an eminent French mathematical physicist, was born at Pithiviers, June 21, 1781, and died at Paris, April 25, 1840. He was educated at the *École Centrale* at Fontainebleau and at the *École Polytechnique* at Paris. Only four years after entering the latter he became its professor of mechanics and analysis. In 1812 he was elected to the Academy. Among his most important works must be mentioned, in pure mathematics, his contributions to the calculus of variations and to the theory of probabilities; in astronomy, his proof of the stability of the solar system; in physics, his very important theorems in electrostatics and in fluid motion, his theory of capillarity and his mathematical theory of heat. His *Mechanics* was a standard textbook for half a century. See Arago's *Notices Biographiques*, Vol. 2.

Poitiers (*pwä'tyā'*), a city of France, occupying the summit and slopes of a hill at whose base flow Clain and Boivre Rivers. Before the French Revolution it had a large number of religious edifices, which even yet are quite numerous. Within and about the city are numerous Roman and Celtic remains, and here, in 1882, the remains of an entire Gallo-Roman town were discovered, with temple, baths and streets spread over 14 acres. In the vicinity of Poitiers Alaric II, the Visigoth was defeated and slain by Clovis in 507, and between Poitiers and Tours Charles Martel won his great victory in 732 over the Saracens under Abd-ur-Rahman. On Sept. 19, 1356, about five miles north of the city, Edward the Black Prince, with only 12,000 or 14,000 English and Gascon troops, defeated about 60,000 of the troops of King John of France, killing 11,000 and taking more than 2,000 prisoners. Population 39,302.

Po'land (called by the natives *Polska*, a word of the same root as *pole*, a plain), a former kingdom of Europe, was, before its partition by Austria, Russia and Prussia, bounded on the north by the Baltic Sea and the Russian provinces of Riga and Pskof; on the east by the Russian provinces of Smolensk, Tchernigoff, Poltava and Kherson; on the south by Bessarabia, Moldavia and the Carpathian Mountains; and on the west by the Prussian provinces of Silesia, Brandenburg and Pomerania. Its greatest length from north to south was a little more and from east to west a little less than 700 miles, embracing an area of about

280,000 square miles. This extensive tract (now greatly contracted) is crossed only by one range of hills, which rises from the north of the Carpathian Mountains and runs northeastward, forming the watershed between the rivers which flow into the Baltic and Black Seas. Much of the soil is rich pasture-land, and considerable is occupied with forests of pine, birch and oak. There is no real Polish history till the reign of Mieczyslaw, 962–92. He became a convert to Christianity, and Poland took her place as one of the political powers, which she continued to hold till the close of the 18th century, when her independence was destroyed and her territory divided between Austria, Russia and Prussia. The first partition of Poland took place in 1772, when Russia seized 42,000 square miles of her territory, Prussia 13,000 and Austria 27,000. In 1793, after a fruitless resistance to the united forces of Russia and Prussia, Poland suffered another loss of territory, Russia taking possession of 96,000 square miles and Prussia of 22,000. The Poles became desperate, and there was a general uprising of the people against the invaders. The Prussians were compelled to retreat to their own country, and the Russians were several times routed. But Austria engaged in the contest, and fresh Russian troops also arrived. Kosciusko (*q.v.*) being defeated and taken prisoner at the battle of Maciejowice, the Russians entered Warsaw (1813) and the Polish kingdom came to an end. In the third and last partition of Poland the remainder of the country was divided as follows: Russia, 49,018 square miles (all of Poland she now owns); Prussia, 21,000; Austria, 18,000. King Stanislaus resigned his crown, and died at St. Petersburg in 1798. The main causes of the downfall of Poland, in addition to the greed and selfishness of the European powers, were the want of union and patriotism among the nobles; the want of a national middle-class, the trade of the country being almost entirely in the hands of the Jews and Germans; the intolerance of the Jesuits; the weakness of the kings; and the want of natural frontiers. To-day Poland forms a government department of Russia, embracing ten provinces and a population of 11,671,800. In 1864 it was deprived of its administrative independence. In 1868 it was incorporated as an integral part of the czar's dominions; trial by jury was abolished, and the official use of Polish prohibited. There are two main parties: the Nationalists and the Socialists, both equally opposed to Russian government.

Po'lar Bear. See BEAR.

Polar Circle. See ARCTIC CIRCLE.

Polar Ex'plora'tion. The original motive of the English in exploring the arctic seacoast was to discover a route to the wealthy countries of eastern Asia and to share in the traffic formerly monopolized by Spain and Portugal. Thus arose attempts both to sail eastward along the north of Europe and Asia and westward across the Atlantic. Hence arose the terms, northeast passage and northwest passage. Some have traced the history of arctic exploration to the time of King Alfred, but Cabot's discovery of Labrador and Newfoundland in 1497 may be deemed the first step in the exploration of American polar regions. Frobisher first sailed in 1576, and in 1585–8 the great navigator Davis sailed up the strait bearing his name and coasted the west of Greenland, the "land of desolation." Hudson, who had formerly tried the northeast passage in 1610, discovered the great bay and strait that bear his name. From the size of the bay he thought it was a part of the Pacific Ocean, but this was disproved by Button, the next English explorer, two years later. After the expedition of Fox and James in 1631, which led only to the partial exploration of what was then named Fox Channel, the North American coast was neglected for more than a century. In the reign of George III there was a revival of English zeal in naval adventure and discovery. Captain Phipps (afterwards Lord Mulgrave) sailed in 1773 to Spitzbergen, where the heavy pack-ice kept him for nearly a month from proceeding further north. He finally reached 80° N., but Cook, who made the next attempt could only penetrate to 70° 45′. After these failures there was no further effort until 1806, when Scoresby explored Jan Mayen Island and the eastern coast of Greenland. The famous expedition of Sir John Franklin (*q. v.*) left England, May 18, 1845, his object being to reach Bering Strait from Lancaster Sound. In 70° N. and 98° W. the ships were beset. Among expeditions in search of Franklin was that of Collinson and McClure, which sailed to Bering Strait in 1850. Fixed in the ice on its voyage eastward, McClure's ship was rescued next spring about 60 miles west of Barrow Strait. Belcher now turned toward the Atlantic, and thus McClure reached England in 1854, after traversing the northwest passage from ocean to ocean. He therefore received the honor of knighthood, and $50,000 was voted by Parliament to him and his crew. Several routes are now completely mapped between Davis Strait and Bering Strait; but the northwest passage has proved valueless for commercial purposes.

More recent explorations north of America added little to geographical knowledge, however interesting their scientific aspects. The expedition of Kane and Hayes in 1853–5 reached Cape Constitution in 82° N., and saw what appeared to be an open polar sea. In 1871 Captain C. F. Hall

sailed from New London, United States, and reached 82° 16′ N., which was surpassed in 1876 by the English expedition under Captain Nares. More famous and more disastrous was the Lady Franklin Bay expedition of 1881 under A. W. Greely (*q. v.*). In October, 1883, Greely landed at Cape Sabine, one of the bleakest spots in the arctic regions, and there, in June, 1884, Commander Schley found the six men who still survived. In 1869-70 Captain Coldewey's expedition reached 77° on the east of Greenland. The *Jeanette* expedition under Commander De Long (*q. v.*), sent by the New York *Herald* in 1879 to push north by Bering Strait, ended in disaster, the vessel being ice-crushed in June, 1882.

In the summer of 1886, Robert E. Peary (*q. v.*) advanced one hundred miles on the ice-cap of northern Greenland due east from the head of Disco Bay, reaching an altitude of 7500 ft. In 1888 Nansen crossed the ice-cap in southern Greenland from east to west, attaining an altitude of 9000 ft. Peary set out again June 6, 1891, reached McCormick Bay July 24, and established his winter quarters there, his ship commanded by Heilprin returning home. Starting northward May 14, 1892, across the inland ice-cap of Greenland he reached the unknown northern part of the east coast of Greenland July 4, at Navy Cliff, Independence Bay. In 1892 Heilprin came north again for the expedition and it returned home, having determined the northern limits of the Greenland ice-cap. In the same year Jackson, under the patronage of Sir Alfred Harmsworth, explored Franz Josef Land. In 1895 Peary again crossed the ice-cap to Independence Bay but was compelled by lack of food to return without having accomplished much beyond his previous trip.

A noteworthy attempt was made by Nansen, who, having constructed a ship after his own designs, permitted it to be frozen into the ice-pack of Kara Sea in 1893, and with the ice his ship was drifted across the frozen seas. He had hoped to come out of the ice between Iceland and Spitzbergen; but, the ice-pack not floating so far north as he had supposed, he left the ship and sought to go further on foot. At last he was obliged to turn back; and he reached Franz Josef Land in 1895 and returned to Norway in 1896. His furthest north was 86° 15′.

In 1897 Peary brought home the three great Cape York meteorites which he had discovered in 1894. In 1898-1902 Peary went north again and was gone over four years and three months. In this expedition he rounded the northern end of Greenland, and proved conclusively its insularity. He reached 83° 17′ N. Lat., on the sea ice north of Grant Land. The Duke of Abruzzi, who sailed in 1899, reached a point 19 geographical miles nearer the goal sought than had been reached by Nansen, Cagni, his captain reaching 86° 33′. In 1898-1901 Sverdrup made extensive explorations in Ellesmere Land. In 1905 Peary made another attempt in his ship the Roosevelt, built for him by the Peary Arctic Club. With the ship he reached 82° 27′ N. Leaving his ship in Feb., 1906, he pushed forward with dog-sledges and reached 87° 6′ N., the furthest north. In 1903-06 Amundsen (*q. v.*) determined the northern magnetic pole and traversed the northwest passage from the Atlantic to the Pacific. In 1906-08 Leffingwell, Mikkelsen and Skarkersen explored unknown Beaufort Sea, north of Alaska and west of Parry Archipelago. Wellman tried to sail by airship from Spitzbergen to the pole.

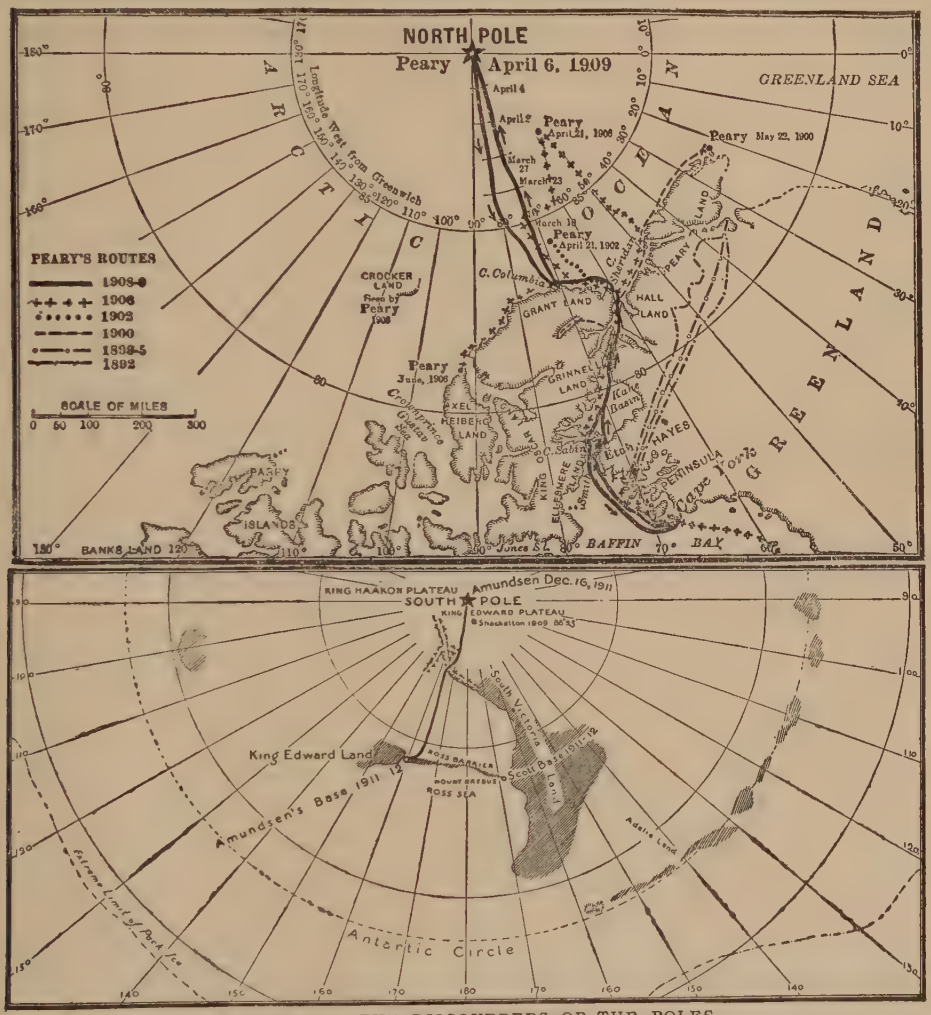
In 1909 came the announcement that the long sought goal—the North Pole—had been reached. Dr. Frederick A. Cook (*q. v.*) who went on a cruise in arctic waters in the summer of 1907, announced from Copenhagen Sept. 2, 1909, that he had found the Pole April 21, 1908. Five days later Commander Robert E. Peary reported by wireless message from Labrador that he had planted the flag at the Pole April 6, 1909.

Dr. Cook's account of his expedition related that during the winter of 1907-8 at Annootok on the west coast of Greenland, he gathered an equipment of sledges, men, dogs and provisions and on Feb. 19, 1908, started north. Advancing into the polar sea, on March 18 he sent back a part of his men and dogs and when the crossing of the polar pack was begun the train was further reduced to two men and twenty-six dogs. With these he started on his final dash of four hundred and sixty miles to his goal, which he reached on April 21, 1908. Remaining there for two days for taking observations, he began the return journey April 23. Delayed by unfavorable conditions and baffled by westerly drift, he struggled southward, was carried down to Crown Prince Gustav Sea, wintered on Jones Sound, and the shore of Greenland was finally reached April 15, 1909.

Cook's claim was promptly challenged by Peary, and was assailed from many sources. To his critics Cook replied: "I honestly believe I have found the North Pole, and I am willing to submit all my evidence to competent scientists, astronomers and explorers." He later submitted his records to a committee of scientists appointed by the University of Copenhagen, with the result that on examination his proofs were found insufficient, his claim was discredited and his honorary degree of Doctor of Science which had been conferred upon him by the University was withdrawn. Cook's narrative describes conditions near the pole in harmony with Peary's testimony in respect to temperature, ice surface and absence of land. This coincidence is held by Cook's friends to indicate that he really reached that region, even though through lack of scientific knowledge he was not able to establish his claim.

The Peary expedition sailed from New York in the steamer Roosevelt in July, 1908,

and reached Etah, Greenland, August 8. It passed the winter at Cape Sheridan, engaged in hunting trips and pushing supplies to Cape Columbia where a supply depot was established. Leaving the Roosevelt a start was made for the Pole by dog train on Feb. 15, 1909, the expedition being divided into six sections which started on successive days. The entire expedition comprised 7 white men, 19 Eskimos, 140 dogs and 23 sledges. From Cape Columbia the course was due north over the ice. Sections of the expedition were sent back from time to time, reducing the outfit with the advance northward. Prof. Ross G. Marvin of Cornell University, who turned back at 86° 38′ in charge of the third supporting party, was drowned April 10, when 45 miles north of Cape Columbia. At 87° 48′ the fourth and last supporting party turned back under command of Capt. Bartlett of the Roosevelt. Peary, now the only remaining white man, with Hensen, the Negro who had been with him on a former expedition, and four Eskimos now pushed forward with all possible speed. Conditions were favorable, the ice comparatively free from obstacles, the temperature rose to 15° below zero, and rapid progress was made. A march of thirty miles was recorded on the last day. At last on April 6 the Pole was reached. Here thirty hours were spent in taking observations, taking photographs, planting flags etc. The return trip was over the trail that had been made. Cape Columbia was reached on April 23, and the Roosevelt at Cape Sheridan four days later.



ROUTES OF THE DISCOVERERS OF THE POLES

Sailing south July 18, Indian Harbor was reached Sept. 5, from which point the wireless message was sent to the world.

Both Peary and Cook state that conditions for travel were more favorable in the region near the Pole than in lower latitudes. The ice was less rough, there were fewer leads, fewer ridges formed by ice pressure, and the temperature was not so low. Cook reported a temperature of 83 degrees below zero at Ellesmere Sound. Peary reported a minimum of 59 below between the 84th and 85th parallel, while at the 89th the temperature rose to 15 below, and at the Pole the minimum was 33 below zero. Cook reported a minimum of 38°. There was no land and no life; a dead sea of ice and snow.

Few attempts to penetrate the unknown regions of the southern or antarctic pole were made, after the expeditions of Wilkes, d'Urville and Ross (1839–43), until recent years. Knowledge of these regions is valuable only from a scientific point of view. But in 1892 Larsen of Norway discovered fossils in 64° 10′ S., 57° W., which interested him as showing that the antarctic regions were once covered by coniferous trees. Next year Larsen led an expedition through this region, reaching 68° 10′ S. and 60° W. The coasts were high, rocky and [mostly covered with ice. Seven islands were discovered, two covered with volcanoes. In 1894 Foyn, visiting the southern seas in search of whales, reached 74° S., and on Jan. 23, 1895, a landing was made at Possession Island. The first vegetable growth (a lichen) ever found within the antarctic circle was found at Cape Adare and Possession Island by C. E. Borchgrevink, a Norwegian, while upon this expedition. Part of the lands supposed by previous explorers to constitute islands were found to be joined to the main land of the antarctic continent; and lands supposed to be islands by the earliest explorers were found to be surrounded by water. In 1898–9 a British expedition under Borchgrevink reached 78° 50′ S. In 1901 English, German and Norwegian expeditions sailed to see whether there is an antarctic continent. In 1904 Charcot of France wintered off the western coast of Graham Land, south of Cape Horn, and in 1908 he headed another French expedition. Arctowski, a member of the Belgica expedition of 1897–9 organized a Belgian expedition in 1908 to make a circumpolar voyage, with special attention to the region between Graham and King Edward Lands.

In August, 1901, an antarctic expedition sailed from England on the Discovery, in command of Captain Scott, reached Victoria Land in December and wintered at the foot of Mt. Erebus. In September, the beginning of the antarctic spring, Captain Scott pushed forward with a sledge party and reached 82 degrees and 17 seconds, the farthest south up to that date. This expedition was followed by that of Lieutenant Shackleton, who sailed from England on the Nimrod in August, 1907. Shackleton left Lyttleton, New Zealand, Jan. 1, 1908, and reached McMurdo Sound, where winter quarters were established on Cape Royds. September 22 a division was sent in search of the magnetic pole, and on Oct. 28 Shackleton with three others started on the long sledge journey toward the South Pole. During nearly the whole course they were beset with hardships and perils. A final march was made January 9, 1909, and latitude 88° 23′ was reached, one hundred and eleven miles from the Pole, the altitude being between 10,000 and 11,000 feet above the sea level. Both food and endurance were so nearly exhausted that to go further was out of the question. Returning Shackleton reached New Zealand March 22, 1909. The results of the expedition were important. The Magnetic Pole was located at 75° 45′ south, longitude 145°. It was established that the Great Southern Ice Barrier is bounded by mountains running in a southeasterly direction from 78° south to 85° south at least, and that an immense glacier leads to a plateau over 10,000 feet above the sea level, on which is situated the geographical South Pole. Rock formations show that at some period a warm climate prevailed in these regions.

Stimulated by Shackleton's report, and also by Peary's capture of the North Pole, no less than five expeditions soon followed in search of the South Pole—Capt. Scott's (English), Dr. Mawson's (Australian), Lieut. Shirase's (Japanese), Lieut. Filchner's (German) and Roald Amundsen's (Norwegian). The prize was won by Amundsen, who sailed from Norway in 1910, in the *Fram*, the vessel in which Nansen had sought the North Pole. He reached Whales Bay early in 1911, and there went into winter quarters. He pushed on in February as far as 84° south latitude and established depots of food supplies at intervals, returning to winter quarters. The sun disappeared April 22 and returned Aug. 24. On Sept. 8 he started for the Pole. Finding conditions unfavorable he returned to winter quarters and waited until Oct. 20, when with 5 men, 4 sledges, and 52 dogs he again started south. On Nov. 17 he reached the great ice barrier, latitude 85°, and climbed to the top of the polar plateau, to a height of 10,000 feet. Here he killed 24 dogs, and with 18 dogs and three sledges pushed on over a vast plateau clad in snow and glacier ice, reaching the Pole Dec. 14. Here he remained three days. On the 16th he took observations every hour for 24 hours, and located the Pole in a vast plain, which he named King Haakon VII Plateau. Here he planted the Norwegian flag and a *Fram* pennant. Returning he reached his winter quarters Jan. 25, and on March 7 from Tasmania he announced by

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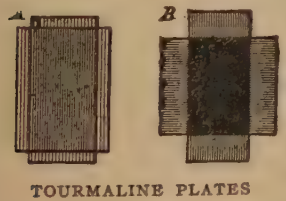
POLAR SEA

cable that he had attained the Pole. Amundsen found the temperature at the Pole only 9.4° below zero in Antartic summer. Scott reached the Pole also and found Amundsen's records but perished on his return journey. (See SCOTT, CAPTAIN R. F.)

Polar Lights. See AURORA BOREALIS.

Polar'ity. This is a term difficult to define, except by such examples and illustrations as the two poles of the earth (ends of the axis on which it revolves) and the north and south poles of a magnet. A globe or sphere not in motion presents the same aspect in every direction; but let it begin to rotate about some diameter, and at once it becomes a polar body. Looked at from one end, it appears to rotate from left to right like the hands of a clock or watch; looked at from the other, it appears to rotate in a counter direction or from right to left. To any one in the northern hemisphere looking toward the equator, the sun and other heavenly bodies appear to move from left to right; but to people of the southern hemisphere, facing the equator, they appear to move in an opposite direction or from right to left. Thus we see that such terms as up and down, right and left, can be defined only by applying them to the motion or position of some particular object; and the rotation of any object may be used to give us an idea of its polarity. Perhaps the most familiar example of polarity is the magnet. Its polarity is a force polarity, the ends or poles of one magnet having a selective action upon the ends or poles of the other. This particular action, however, is only one among many manifestations of magnetism; and the general tendency among scientists is to explain all magnetic phenomena as essentially *rotational*, the difference in the poles of the magnet being accounted for by the theory of revolving currents of electricity in planes perpendicular to the direction of the magnetic force.

Po'lariza'tion of Light. In the evidence which is ordinarily adduced for thinking that light consists in a wave-motion of the ether nothing is said as to whether light vibrations are longitudinal, as is the case with sound, or transversal, as is the case with water-waves. The phenomenon which answers this question decisively is the polarization of light.



TOURMALINE PLATES

The facts are as follows: If we take a thin slice of a tourmaline crystal, cut parallel to its crystallographic axis, and examine the light which passes through it from any ordinary source of illumination, say the sky, we shall find the transmitted light of a greenish, olive color. If we take a second crystal exactly like the preceding, and place it on top of the first crystal, in such a way that the axes of the two are parallel, we shall find the light transmitted as before, only with greater absorption, since it now has to pass through a greater thickness. Suppose, however, that we rotate one crystal upon the other, so that their axes no longer are parallel although their faces remain in contact; we shall find that the second crystal becomes less and less able to transmit the light delivered to it by the first crystal; and when the second crystal has been so turned as to have its axis at right angles to the axis of the first crystal, *no light at all will pass through both crystals.* This latter position is shown in B, Fig. 1; the former position, with axes parallel, is shown at A, Fig. 1. The ray of light is here to be imagined as falling upon the plate of tourmaline in a direction which is perpendicular to the plane of the drawing. Either crystal alone will transmit the original ray however the crystal be placed; but either crystal alone behaves very differently toward a ray which has once passed through a piece of tourmaline. In fact the passage of the ray through the tourmaline has given it a new property; for it now behaves differently in different azimuths. [An azimuth is an arc of the horizon intercepted between the meridian of the place and a vertical circle passing through the center of any object.] Such a ray is said to be *polarized.* The fact that it has different properties on different sides, so to speak, proves that light-waves must be transversal. If the disturbance in the ether were "end on," as in the case of sound, it could not possibly make any difference how one rotated the tourmaline through which the light is viewed.

In the early part of the 19th century it was discovered by Malus that light which has been reflected from any polished surface has this property, which is called polarization, in a greater or less degree; and when reflection occurs at a definite angle, known as the angle of polarization, the reflected beam is almost completely polarized. It has been proved by Hertz and Trouton that the vibrations in polarized light are at right angles to the plane of polarization.

Pol'der, in the Netherlands, is land below the level of the nearest water, which, originally a morass or lake, has been drained and brought under cultivation. An embankment forming a canal high enough to carry the water to the sea or a river is made and apparatus for lifting the water is placed at one or more points. If the lake deepens toward the center, several canals become necessary, formed at different levels as the

water surface lessens, a connection being maintained with each other and with the first or outer canal which carries the water to the sea or river. In Schermer Polder in North Holland are four canal levels, the land between them forming long parallelograms.

Pole'cat, a carnivourous animal with a long, slim body like a weasel. Four species inhabit the northern hemisphere. The common polecat of Europe is dark brown above and black below. Its fur is of little value. They sleep by day, and at night plunder poultry-yards and dove-cotes. They feed also on rabbits, rats, mice and birds. Very similar species are found in Siberia, Tibet and North America. These animals emit a foul odor when disturbed. The ferret is a domesticated variety of polecat. In the United States the name sometimes is applied to the skunk incorrectly.

Poles (Greek *polos*, a turning point), in geography are the two extremities of the axis round which the earth revolves, the north pole being 90° north of the equator and the south pole 90° south. In astronomy the poles, which for distinction are called celestial poles, are those points in the heavens to which the earth's axis is directed and round which the heavens seem to revolve. Unfortunately no stars mark the exact position of the celestial poles, and therefore the polestar is used for this purpose, its exact position being determined by noting the point between its upper and lower *culminations*. The term poles also has a wider application as denoting the extremities of a line passing through the center of a great circle perpendicular to its plane. Thus we have the poles of the horizon (which are the zenith and the nadir), the poles of the ecliptic and the poles of a meridian. In the same sense the terrestial and celestial poles are spoken of as the poles of the equator and the equinoctial, respectively. Poles in physics denote those points of a body at which its attractive or repulsive force is concentrated.

Pole'star or **Pola'ris,** the star nearest to the northern pole of the celestial quarter. The star which at present goes under the name of the polestar is *Alpha* in the constellation of *Ursa Minor*. This star, however, is a little more than 1° from the north pole and has a sensible motion around it. This star will in about 2,100 A. D. come within 28′ of the north pole of the heavens, and then recede. Two thousand years ago *Beta* of *Ursa Minor* was the polestar, and about 2,300 B. C. *Alpha* in the constellation of the Dragon was not more than 10′ from the north pole, while 12,000 years after the present time the bright star *Vega* in *Lyra* will be within 5° of it.

Pole-Vault'ing is one of the sports called field-events. It consists in leaping over a bar by means of a pole. Usually this is 16 feet long. The contestant grasps the pole above his head, measures the height of the bar with his eye, and runs forward. At a certain distance from the bar he thrusts the pole into the ground, leaps up, and throws himself forward and up over the bar, at the same time flinging the pole behind him. Generally three trials at different heights are made. The highest record is 12 feet nine inches.

Police (*pō-lēs′*) are an organized force — especially in towns and cities — for the preservation of peace and order and the prevention of crime. This definition applies more particularly to the police of the United States and of England, as the police of most European countries have much wider functions, and are often used by rulers and ministers for political purposes and in a more or less oppressive manner. The existing sytem of police administration in England is of recent origin, and many features of it were introduced during the reign of Queen Victoria. In the early periods of English history there was no such thing as a separate body of police, the responsibility for the maintenance of the peace being imposed on each hundred or tithing and the individuals composing these divisions being held jointly liable for the consequences of any violations of law which occurred within their limits. In the larger towns the inhabitants of the various wards kept watch within their limits, special watchmen being gradually introduced; but these duties of watch and ward were performed very inefficiently, and crimes were committed with marked impunity, especially in London and other large cities. During the 18th century various efforts were made to remedy this state of things in London and to secure a more efficient administration both in the prevention and detection of crime; but the results obtained were very unsatisfactory. In 1829 Sir Robert Peel organized the metropolitan police, placing the new force under the control of the secretary of state, and since that time the police of counties and boroughs have been organized upon the same principles as the metropolitan police, except that they are under the local authority. The strength of this body of metropolitan police was 19,761 in 1911; 31 superintendents, 604 inspectors, 2,620 sergeants and 16,506 constables. The City of London police-force numbers 1,180 men, exclusive of those on private service and detective duty and of those known as metropolitan police. The police-force throughout the kingdom is a civil, not a military body, with the exception of the royal Irish constabulary, which is more military than civil. This force is directly under the Irish government, and its members are armed and drilled as soldiers. It

consisted in 1905 of 11,338 members under the command of an inspector-general, each county being supervised by a county-inspector and divided into separate districts over which are placed district-inspectors. Below these officers are sergeants and constables, trained in the use of arms and disciplined as soldiers. The police-force of Scotland numbered 5,356 and of England and Wales 45,202.

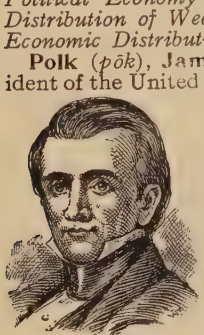
In the United States each town or city has its separate administration; but, in general, the police-system is much like that of England. The present police organization of New York, which was substituted for the inefficient night-watch in 1845, may be taken as a type of the American system generally. It consists of a board of police, comprising four commissioners appointed by the mayor, and the police-force, who with their various officers are appointed by the board. The city is divided into four inspection-districts, which are subdivided into 35 precincts. At the head of the force are a commissioner and deputies, a chief inspector, under whom are one borough and 12 district-inspectors, a captain over each precinct, sergeants, roundsmen (visiting officers), patrolmen (the body of the force) and doormen at the stations, besides 23 surgeons and 68 police-matrons. The captains report every morning to the central office. The roundsmen must see that the patrolmen perform their duties, and the sergeants are responsible for both. Besides the general force there are several bodies or squads organized for special services. Among these are the sanitary police, the detective-force, the harbor-police, park-police and two boiler-inspectors. In 1911 the police-force of Greater New York numbered 10,136 men, of whom 8,564 were patrolmen, the annual cost of the entire force being about 15 million dollars. The police-force of Chicago—now the second city in the Union—during the year 1910 numbered 4,260 and cost $5,825,454.

Polit'ical Econ'omy has various definitions; but there is a general agreement that it is the science relating to the production, distribution and exchange of wealth. The word is derived from the Greek words *oikos* for house and *nomos* for law or rule; but in its wider application it refers not only to the laws and institutions of nations in reference to industry and trade but to the arrangements of Providence in reference to the supply of man's physical wants. Although economic questions of various kinds occupied the minds of the Greeks and some other ancient nations and were discussed by their leading thinkers and writers, there was no real science or system of political economy until the time of Adam Smith and his forerunners in the 18th century. Smith's *Wealth of Nations* was the first systematic exposition of the subject by a man thoroughly qualified for his task; and his teaching was defined by himself as a system of natural liberty. He opposed all regulations and restrictions of trade, as protective tariffs, that seem to interfere with the natural order of things, thus following the school of Rousseau in advocating a return to nature from what he deemed a perverted civilization. He also followed the example of his predecessors, and showed himself in harmony with the new era by making labor the source of wealth. The greatness of Smith's work lies in the fact that he summed up the best thought of preceding times and that his writings have been made the basis of all subsequent progress in economic science. But great as his influence has been, his ideas have by no means commanded general acceptance. His system has been variously criticised as too abstract and merely theoretical; and his followers have been characterized as "students of maxims rather than markets." The strongest point, perhaps, that is urged against him and his school is that they overlook the importance of the *nation* as the unit in economic growth and development. In answer to Smith's various arguments it is urged that economic questions must be studied in the light of actual conditions in each state or nation and that the wise policy can be determined only from a knowledge of all the factors that enter into industry and trade. Great changes have also taken place since Smith's time, which have added new complications to the questions at issue and have placed political economy in a still more unsettled and unsatisfactory condition. Among these changes the most important is the introduction of machinery, by which individual enterprises have given place to vast corporations and trusts, thus making the relations between capital and labor one of the leading questions in political economy; and it is urged with great force that the concentrations of capital make such a condition in the industrial world that the various issues between capital and labor cannot be settled by the mere "law of supply and demand," but that moral principles must also be invoked. Hence the relation of political economy to ethics must be considered by students of the science in our time.

In the United States one of the leading questions in political economy is that of high or low tariff. While individual opinions range from the extreme positions of absolute free trade (the admission of all foreign imports without duty) to tariff rates that would almost prohibit the introduction of foreign products, the Republican and Democratic parties may be said to be divided on the question whether tariff duties should be levied on foreign imports for purposes of revenue only or whether we should also have a "system of protec-

tion" under which our manufactures should be secured against competition with those of other countries. This question has been a fruitful theme of discussion by statesmen and legislators from Washington's administration to the present time, even to the extent of being made the leading issue in several presidential campaigns. See *Wealth of Nations* by Adam Smith; *Principles of Political Economy* by J. S. Mill; Clark's *Distribution of Wealth;* and Hobson's *The Economic Distribution.*

Polk (*pōk*), **James Knox,** eleventh president of the United States, was born in Mecklenburg County, N. C., Nov. 2, 1795. He was educated at the University of North Carolina, and after studying law was admitted to the bar at Columbia, Tenn., in 1820. Three years after this he was chosen a member of the legislature, and in 1825 was elected to Congress as a Democrat. In 1835 he was made speaker of the house of representatives, a position which he filled with credit and ability. In 1844 he was the Democratic candidate for the presidency against Henry Clay, and was elected by a popular majority of only 38,000 but by an electoral vote of 175 to 105. The principal feature of Polk's administration was the Mexican War, by which the United States acquired Texas, California and New Mexico (then including Arizona). Texas was annexed just before Polk's inauguration; and soon after he became president he sent General Taylor to occupy the disputed territory between the Nueces and Rio Grande, Mexico claiming that this territory never belonged to Texas. In March, 1846, Taylor advanced to the Rio Grande and built Fort Brown, opposite the Mexican port of Matamoras. General Arista, the Mexican commander, then crossed the Rio Grande to attack Taylor, but was defeated at Palo Alto and Resaca de la Palma, and forced to recross the river. War was at once declared by Congress against Mexico and was prosecuted with energy and vigor until the City of Mexico was occupied by General Scott in September, 1847. During Polk's administration, by a compromise treaty with England, the northern boundary line of Oregon territory — now the state of Washington — was fixed at 49°. The low-tariff act of 1846 was a favorite measure of Polk's, being passed in the senate by the casting vote of Vice-president Dallas. Other features of his administration were the admission of Wisconsin as a state in 1848; the adoption of the subtreasury system by which the funds of the government are kept in vaults in Washington instead of being deposited in banks; and the creation of the interior department, its secretary being added to the cabinet. On the expiring of Polk's term he retired to his home, Nashville, Tenn., where he died, June 15, 1849.



JAMES K. POLK

Polk, Leon'idas, general in the Confederate army and bishop of the Protestant Episcopal church, was born at Raleigh, N. C., April 10, 1806. He graduated at West Point in 1827 and received a commission in the artillery, but resigned and studied for the ministry. In 1838 he was consecrated bishop of Arkansas and Indian Territory, with charge of the dioceses of Alabama, Mississippi and Louisiana; but in 1841 he resigned all except the bishopric of Louisiana, which he held until his death, even when commanding a corps in the Confederate army. Soon after the outbreak of the Civil War Bishop Polk tendered his services to the Confederate government, and was appointed major-general by Jefferson Davis. He commanded an army-corps at Shiloh, and in October following was made lieutenant-general. At Chickamauga he commanded the right wing of Bragg's army, and, being charged by that officer with disobedience of orders, was relieved of his command for a short time, but was afterward restored, and served under Gen. Joseph E. Johnston in Sherman's Atlanta campaign. He was killed by a cannon-shot while reconnoitering on Pine Mountain, June 14, 1864.

Pol'len, the microspores of seed-plants. Pollen is developed within pollen-sacs, which occur on the anthers of stamens. Each pollen-grain is an asexual spore, consisting of a single cell, which has an outer heavy and more or less modified wall, known as the exine, and a delicate inner wall, known as the intine. Pollen-grains are often variously marked, sculptured and even winged by the modifications of the exine. Certain pollen-grains, as those of the mallows, are covered with conspicuous spiny points, and this family may be recognized by its pollen. Pollen has often been mistaken as the equivalent of a male cell, being spoken of as the male element. It should be distinctly understood that pollen grains are microspores and that microspores are asexual spores. When the pollen germinates, as other spores do, it produces a male gametophyte, as do all microspores. It is in connection with this new plantlet or male gametophyte that the sperms are developed.

Pol'lina'tion, the transfer of the pollen of plants from the stamen which produces it to the stigma which is prepared to receive it. Pollination is frequently confused with fertilization. Fertilization is the union of the male cell and egg, which may or may not follow pollination. In general this transfer of pollen is effected by one of two agents, the wind or in-

sects. The plants which use wind as a carrier of pollen are called anemophilous plants; those which use insects for this purpose are called entomophilous. The gymnosperms and many of the more primitive angiosperms, as grasses and many of the common trees, are anemophilous. The great majority of angiosperms are entomophilous, and their flowers have been modified in every way to be adapted to insect-visits, and the insects have been variously adapted to flowers. For anemophilous pollination see GYMNOSPERMS. Entomophilous pollination is of two kinds: namely, self-pollination, in which the pollen is transferred to the stigma of its own flower; and cross-pollination, in which the pollen is transferred to the stigma of some other flower. In the case of cross-pollination the two flowers concerned may be upon different plants which may be quite distant from one another. The advantage of this relation to the insects is to secure food. This the flower provides either in the form of nectar or pollen, and the insects which pollinate flowers may be roughly divided into the two groups of nectar-feeding insects, represented by butterflies and moths, and the pollen-feeding insects, represented by bees, wasps etc. The presence of these food-supplies is made known to the insect by odor, form and, perhaps, color of flowers. Those insects which are suitable for this work are necessarily flying forms, as creeping insects would brush off the pollen from their bodies in passing from one flower to another. Plants have many devices by which such unsuitable creeping insects as ants may be warded off. Just what the advantage of cross-pollination over self-pollination may be is not clear, but that it is of great advantage is evident from the fact that the angiosperms have made most elaborate attempts to secure it. In most insect-pollinating flowers there are three problems: To hinder self-pollination; to secure the visits of suitable insects; and to ward off the visits of unsuitable insects. Most of the insect-pollinating flowers may fall into three great divisions on the basis of the methods they use to hinder self-pollination. The first division includes those flowers in which the pollen and stigma are so related to each other in position that the pollen is not likely to fall upon the stigma. This method results in much of the irregularity of flowers, and conspicuous among these forms are the sweet peas, irises and orchids. The story of cross-pollination in orchards has been told by Darwin in a wonderfully interesting book. The second division includes those flowers in which self-pollination is prevented, not by the relative positions of the parts, but by the fact that the pollen and stigma are not ready at the same time. When the stigma is ready to receive, the pollen may not be ready for shedding; or when the pollen is ready for shedding, the stigma may not be ready to receive. These are the so-called dichogamous flowers (which see). It is evident that there may be two groups upon this basis: Those flowers in which the pollen is ready first and those flowers in which the stigma is ready first. The former are called protandrous the latter protogynous flowers. The third division includes those flowers in which there are at least two forms, and the two forms differ from one another in the relative lengths of their stamens and styles and in the nature of their pollen. For example, in the common houstonia, a small tubular flower, one kind of flower has the stamens included in the tube and the stigmas protruding; while the other kind has the stigmas included in the tube and the stamens protruding. Each kind of pollen is most effective upon the stigma of the same level. Accordingly, as an insect passes from one such flower to another, crowding its way into the tube, its thorax is likely to receive a band of pollen from the short stamens and its abdomen another band from the long stamens. In this way the pollen from the thorax is rubbed upon the included stigmas and the pollen from the abdomen is rubbed upon the protruding stigmas. The whole story of the relation between insects and flowers is an exceedingly intricate one and full of surprises.

JOHN M. COULTER.

Pollin'ium (in plants). In certain families, notably the milkweed and orchid families, all of the pollen-grains formed within a pollen-sac stick together in a mass which is removed bodily by insects. These masses of sticky pollen are pollinia.

Poll-Tax, a tax levied by the *poll* or head. In England the imposition of a graduated poll-tax in the time of Richard III led to Wat Tyler's rebellion in 1381. A similar tax was imposed in 1513. A tax, varying from 12*d* for a private person to £100 for a duke, was assessed in 1678 and abolished in 1689. In the United States some states impose a poll-tax varying from $1 to $3, while in others the imposition of such a tax is expressly forbidden by the state constitution.

Polit'ical Par'ties in the United States began as early as 1787, with the discussions as to framing the national constitution. When the delegates, chosen from the several states, had agreed unanimously upon a form, there was a difference of opinion as to its merits. Prominent among its friends were Washington, Hamilton, Jay and Madison. A series of 82 able papers in its favor, prepared almost wholly by Alexander Hamilton of New York, were published in *The Federalist.* At once those who sided with this view were called Federalists, and the opponents Anti-Federalists. When Wash-

ington became president, April 30, 1789, the Federalists came into power, and Alexander Hamilton, as secretary of state, rescued the country from bankruptcy by his splendid financiering. During Washington's second term there was a split in his cabinet, and at its close the Anti-Federalists, headed by Thomas Jefferson and Edmund Randolph, elected their candidate, Thomas Jefferson, as vice-president, although the Federalists elected John Adams as president. The combination was embarrassing; but, as the electoral law has been changed, it cannot again occur. The result was the defeat of Adams for a second term and the election of Jefferson to the presidency. In 1801 the Anti-Federalist administration began and the party name was changed to Republican and, later, to Democrat. This party held power until 1840, although in the election of 1824 there were four candidates, all claiming to be Republicans and one wing, under lead of Adams and Clay being known as National Republicans. They were John Quincy Adams, Andrew Jackson, Henry Clay and W. H. Crawford. As neither was elected by popular vote, the matter was decided by the house of representatives, which placed Adams in the presidential chair. Four years later General Jackson, the "hero of New Orleans," was elected and his administration was noted for opposition to the United States Bank and for putting into practice the doctrine that "to the victor belongs the spoils." The Whig party, which was formed in opposition to the Democratic party and took ground in favor of a protective tariff and internal improvements, led by Daniel Webster and Henry Clay, gained its first success in the election of William Henry Harrison in 1840, but the slavery question and the death of Clay and of Webster, both in 1851, so weakened the Whigs that General Winfield Scott, in spite of his splendid military record, was defeated by Franklin Pierce, and the party ceased to exist in 1852. Several other parties arose: the Anti-Masonic party of 1826; the Liberty party in 1840, which was merged in the Free Soil party in 1848; the American party or Know-Nothings in 1854; the Republican party, made up of the Free Soil party and the anti-slavery wing of the Whigs in 1856; the Constitutional Union party in 1860; the Greenback party in 1866; the Prohibition party in 1872; and the Union Labor party in 1888. In 1856 James Buchanan, the Democratic candidate, was elected, and during his administration the Civil War began. In 1860 Abraham Lincoln was elected by the Republican party, which remained in power until 1884, when Grover Cleveland, the Democratic candidate, was elected. In 1888 the Republicans elected Benjamin Harrison, and in 1892 Grover Cleveland was again elected by the Democratic party. In 1896 the Republicans elected William McKinley, of Ohio, and in 1900 he was given a second term in the presidential chair. His chief opponent in both years was William J. Bryan of Nebraska, the nominee of the Silver Democrat and Populist parties. The other factors in both elections were those marshaled under the banners of the Gold Democrats, the Prohibitionists, the Social Democrats and the Socialist Labor Party. In the contest of 1896 John M. Palmer of Illinois led the forces of the National or Gold Democrats. For vice-president the winning men were Garret A. Hobart of New Jersey in 1896 and Theodore Roosevelt in 1900. On the death of President McKinley (*q. v.*) in September, 1901, Vice-President Roosevelt succeeded to the presidency. In 1904 Theodore Roosevelt was the nominee of the Republican party, and was elected president by an unusual majority, his chief opponent being Alton B. Parker, the nominee of the Democratic party. In 1908 William Jennings Bryan for the third time was nominated by the Democrats, while William Howard Taft was the candidate of the Republicans. The Prohibitionists, Socialists and the Independence League also put forward candidates. The vote resulted in the election of Mr. Taft who was re-nominated in 1912 but was defeated by the Democratic candidate, Woodrow Wilson, after an unusually heated campaign. Theodore Roosevelt led the Progressives, a party which was formed as the result of dissatisfaction with certain of Mr. Taft's policies (see TAFT) and the charge that Mr. Roosevelt and his delegates had been unfairly treated in the Republican Convention. The party was the crystallization of a growing sentiment in both the Republican and Democratic parties in opposition to the control of legislation by large business interests, but it was the movement among the Republicans which was the most important element in its formation and it drew its membership largely from Republican ranks.

Po'lo, an equestrian game, which may be briefly described as hockey on horseback. An oblong space is marked out, the usual size of which is 300 by 200 yards; at each end, in the center of the line, two poles are fixed 20 or 22 feet apart, forming the goals through which it is the object of the opposing sides to strike the ball. The players are mounted on ponies, the size of which should not exceed 14 hands, and each player is armed with a polo-stick, a strong cane about four feet long with a crosshead about eight inches in length, with which to strike the ball of light wood. The proper number of players is four to a side, and in polo, as in most other games, combination is the first condition of success. The ponies need to be carefully trained, and they sometimes become very clever in understanding what is required of them. To become a good player requires a quick eye, good

horsemanship and a great deal of practice.

Polo, Marco, the greatest of medieval travelers, was born at Venice about 1254. As a youth he accompanied his father and uncle to the court of Kubla Khan, the ruler of China, then known as Cathay. Pleasing the Khan, he remained for some time in his dominions, learning the language and traveling over the kingdom in the Khan's service. All three Polos amassed wealth and returned, after many adventures, to Venice. In the war between Venice and Genoa Marco was captured by the Genoese and, while in prison, dictated the account of his travels now found in libraries to a fellow prisoner. His stories were very incredulously received by the people of his time. After his liberation he returned to Venice, where he died in 1324, and was buried in the Church of St. Lorenzo. See his work, edited by Henry Yule.

Polybius (*pō-lĭb'ĭ-ŭs*), the Greek historian, was born about 204 B. C. at Megalopolis in Arcadia. He was one of the 1,000 Achæans who, after the conquest of Macedonia in 168 B. C., were sent to Rome on the pretext that the Achæans had failed to assist the Romans against Perseus. At Rome he was the guest of Æmilius Paulus, and became the close friend of his son Scipio Æmilianus, accompanying him in his military expeditions. In 151 B. C. the surviving exiles were permitted to return to Greece; but Polybius followed Scipio in his African campaign, and was present at the destruction of Carthage in 146 B. C. But the war between the Romans and Achæans afterward summoned him to Greece, where he arrived soon after the taking of Corinth; and so grateful were his people for his services in securing favorable terms from their conquerors that they erected statues in his honor in his native city and elsewhere. It was about this time that he undertook the writing of his great historical work, the design of which is to show how and why all the civilized countries of the world fell under the dominion of Rome. He died about 125 B. C.

Polycarp (*pŏl'ĭ-kärp*), one of the early Christian fathers, was born about 69 A. D., probably of Christian parents. Polycarp's life is a very important one from the fact that he bridges the period between the age of the original apostles and that of his own disciple Irenæus. Whether he was actually appointed bishop at Smyrna by the Apostle John may well be doubted, but he certainly occupied a prominent position in the church from his earliest manhood. This is the tribute that Irenæus pays to his memory: "I can tell the very place where the blessed Polycarp used to sit and discourse. . . . Whatsoever things he had heard from John and others about the Lord he would relate as having received them from eyewitnesses." Toward the close of his life Polycarp visited Rome, and on his return to Smyrna became the victim of a persecution of the Christians. Being offered his life by the proconsul if he would renounce Christ, he answered: "Eighty and six years have I served Him, and He has done me only good. Why should I deny Him now?" The games being over, death by fire was substituted for death by wild beasts, the mob eagerly gathering fuel for the flames (A. D. 155). The only writing left by Polycarp is an epistle to the Philippians, the authenticity of which, though seriously questioned, may be considered as clearly established.

Polycrates (*po-lĭk'ra-tēz*), tyrant of Samos from 536 to 522 B. C. After conquering several islands of the archipelago and even some towns on the Asiatic mainland, he waged a successful war against the inhabitants of Miletus and defeated their allies, the Thesbians, in a great sea-fight. His alliance with Amasis, king of Egypt, proves the importance of this insular prince in the eyes even of great monarchs. Amasis broke off the alliance, and when Cambyses the Persian invaded Egypt in 525 B. C., Polycrates sent forty ships in which he placed all the Samians who were hostile to his government, hoping that they would never return. But they soon mutinied against the Persian authority, and sailed back to Samos for the purpose of overthrowing Polycrates. Failing in this effort, they proceeded to Sparta and formed an alliance with the Spartans and the Corinthians. A triple force of Samians, Spartans and Corinthians besieged Samos in vain, and Polycrates became more firmly established in his authority than ever. But evil fortune overtook him at last. His deadly enemy, Orœtes, satrap of Sardis, enticed him to visit Magnesia, where he was seized and crucified.

Polyembryony (*pŏl'ĭ-ĕm'brĭ-ō-nў*) (in plants), a name applied to any case in which more than one embryo occurs in a seed. This is a thing of rare occurrence, although quite a number of embryos start in the seeds of gymnosperms. As a rule, when several embryos begin, one of them sooner or later develops at the expense of the others, which gradually disappear. Now and then, however, more than one embryo is found both in gymnosperms and angiosperms, the extra embryo having arisen either from an extra fertilized egg, as is probably true in the gymnosperms, or as the budding outgrowth from some part outside of the egg, often the case in orange seeds

Polynesia (*pŏl'ĭ-nē'shĭ-ā*), (from Greek *polys* for many and *nesos* for island), a term applied to the islands of the Pacific Ocean east of the Philippines, New Guinea and Australia, except Japan, the Kuriles, Aleutians, Queen Charlotte, Vancouver, Revillagigedo and Galapagos, which are geograph-

ical dependencies of the adjoining Asiatic and American continents. These Polynesian islands — also called South Sea islands — are distributed over a vast area, nearly 11,000,000 square miles, but the extent of dry land is less than 200,000 square miles; while the population probably is less than 1,500,000. Polynesia comprises the three broad divisions of Micronesia, Melanesia and East Polynesia, and each is subdivided into several secondary groups. Micronesia lies on the extreme northwest, almost entirely north of the equator, and consists almost exclusively of small volcanoes and atolls, forming the five archipelagoes of Pelew, the Marianas, the Carolines, Marshall and Gilbert. The area of the islands in Micronesia is only a little over 1,000 square miles; the population is estimated at about 100,000. Melanesia lies in the extreme west, south of the equator, and consists mainly of coral and volcanic islands, disposed in parallel lines from northwest to southeast, forming the eleven archipelagoes of the Admiralty, Bismarck, D'Entrecasteaux, Louisiade, Solomon, Santa Cruz, Banks, New Hebrides, New Caledonia, Loyalty and Fiji, all inhabited by the Melanesian or dark-brown, oceanic race. The land-area of Melanesia is estimated at about 65,000 square miles and the population at about 410,000. East Polynesia, the third and largest division, lies on both sides of the equator, and consists of the twelve archipelagoes of Hawaii, Phœnix, Ellice, Tokelau, Samoa, Tonga, Kermadec, Austral, Cook (Hervey), Tahiti (Society), Tuamotu (Low), Marquesas and New Zealand, besides numerous islets, as Norfolk, Chatham, Easter and others. This division is the special domain of the brown race, commonly called Polynesians in a special sense. Although the Polynesian islands are spread over so large an area, there is great uniformity of climate among them, except in New Zealand. The mean temperature is about 70°, both in Hawaii and New Caledonia (about the two tropics), with an extreme range from 50° to 90°. For more than a century the oceanic peoples have been in contact with Europeans and Americans, and many of the Polynesians, as well as many of the Melanesians, profess some form of Christianity, the first mission being that to Tahiti in 1797 by the London Missionary Society. But this contact appears to have caused a remarkable decrease of the population. The population of Hawaii has fallen from 300,000 in 1797 to 29,787 (the part-Hawaiians numbering 7,843), and a similar falling off has occurred in other islands. Everywhere the pure Polynesian race seems to disappear. This result is due in part to the introduction of alcoholic drinks, in part to the changes of habits, dress etc. introduced by the missionaries, but mainly to the ravages of disease. See Fornander's *Account of the Polynesian Race.* See, also, such articles as ALEUTIAN ISLANDS, VAN DIEMEN'S LAND and other articles in alphabetical arrangement.

Polyp (*pŏl'ĭp*), the individual feeding-animal in a colony of hydroids. The body is tubular, surmounted by a disc which is surrounded by tentacles. The disc is also perforated in the center by a mouth. The fresh-water hydra is an example of a single polyp. The name also applies to individual coral animals. See HYDRA and HYDROZOA.

Polypetalous (*pŏl'ĭ-pĕt' al-ŭs*) **Flowers,** those in which the individual petals are separate and distinct. The contrasting term is sympetalous (which see). Polypetalous flowers are thought to be more primitive than those which are sympetalous. Common illustrations are the buttercups, roses etc.

Polyphemus (*pŏl'ĭ-fē'mŭs*), in classical mythology, the son of Poseidon and the nymph Thoösa. He was a shepherd of immense size, and had only one eye in the center of his forehead. When Ulysses landed on Sicily, he and his companions were seized by Polyphemus and confined in a cave. After the huge cannibal had eaten six of his twelve companions, Ulysses (*q. v.*) intoxicated him and put out his eye with a burning pole, thereby escaping from the cave.

Pol'ytech'nic Schools, also called schools of technology or technical institutes, appear to lie between industrial schools (*q. v.*) and the professional schools of universities. They devote comparatively little time to the humanities, but much to modern languages, mathematics and science, as well as engineering and other semiindustrial, semiprofessional branches. The first school of the kind was established at Paris in 1794, under the name of the School of Public Works. This Polytechnic School, as it is now called, is the school in which France trains artillery officers and engineers, directors of roads and bridges, telegraph officers and, in fact, all officials who need to know something of the higher branches of technical science. In London the Polytechnics at Regent St., Langham Place, Balderton St. and Oxford St. are aided by the County Council. London also has a City Polytechnic with branches at Birkbeck College, Chancery Lane, and the City of London College at Moorfields. The Regent Street Polytechnic offers courses which may be regarded as representative of schools of technology, *e. g.*, in art, book-keeping, business training, chemistry, civil service, cookery, dresscutting, elocution, first aid to the injured, harmony, Italian, landsurveying, the mandolin and guitar, metal-plate work, millinery, photography, the piano, physical culture, physiology and hygiene, the poetry of Robert Browning, shorthand and typewriting, solo singing, theory of music, the violin etc. The Northampton Institute is more nearly professional and more strictly technological in character. It has departments devoted to

mechanical engineering and metal trades, artistic crafts, electrical engineering and applied physics, technical optics, technical chemistry, horology, domestic economy and miscellaneous trades. This curriculum suggests what may be the most proper function of polytechnics: instruction in the more complex branches of modern industry. In America the oldest institution of the kind is Rensselaer Polytechnic Institute at Troy, New York, founded in 1824. Franklin Institute, founded at Philadelphia in the same year, also partook in a measure of the nature of a polytechnic. But it was only after the Civil War that polytechnic schools really became an important factor in industrial progress both directly and through their influence upon collegiate education. In 1865 was opened the Massachusetts Institute of Technology, in 1868 the Worcester Polytechnic Institute, in 1866 Lehigh University and in 1871 Stevens Institute of Technology. Moreover, since the land-grant act of 1862, about 60 colleges of agriculture and mechanic arts have received a generous endowment. Probably the best equipped polytechnic school at present in the United States, although it does not employ the name, is the New York Trade-School founded in 1881 by the late Colonel R. T. Auchmuty. It, perhaps, is an open question whether polytechnics which attempt to teach a great number of arts are as efficient as schools devoted to a single art or to few arts. In Germany a single specialty is taught in a *Fachschule*. The textile schools illustrate the efficiency of this plan in America. With the best American polytechnics may perhaps be classed such institutions as the Williamson and the San Francisco Trade-School, Drexel and Pratt Institutes and the New York Institute for Artist-Artisans, in addition to others already mentioned.

Pombal (*pŏm-bāl'*), **Sebastian Joseph de Carvalho e Mello,** Marquis of, the greatest of Portuguese statesmen, was born on May 13, 1699, at the castle of Soure, near Coimbra. In 1739 he was appointed ambassador to London, and six years later was sent to Vienna in a similar capacity. Just before Joseph I ascended the throne, Pombal was made secretary for foreign affairs, and after the great earthquake at Lisbon in 1755 he displayed such wisdom and ability that in the next year the king appointed him prime minister. After subduing a revolt and conspiracy against the life of the king, he abolished slavery in Portugal (*q. v.*), sought to establish good elementary schools and published a new code of laws. In addition to this he reorganized the army and established a Portuguese East India Company. The tyranny of the Inquisition was also broken, besides numerous other reforms. On the accession of Maria I in 1777, who was under clerical influence, Pombal was deprived of office and banished from court, while many of his institutions were abolished. He died at his castle of Pombal, May 8, 1782. The peasantry always speak of him as The Great Marquis.

Pome (*pōm*), a fruit, as the apple, pear, quince, in which the fleshy part is developed by a flower-structure outside of the pistils. This structure is commonly referred to as the calyx, but it really is the cup-like outgrowth from which sepals, petals and stamens arise. See FRUIT.

Pomegranate (*pŭm'grăn'ăt*), the fruit of *Punica granatum*, a tree belonging to the order of *Lythraceæ*. It is a native of Asia, and is very commonly cultivated throughout the tropics and semitropics. It rises 15 or 20 feet, and has numerous slender branches, some of which are armed with thorns. The fruit is globular, about as large as a small apple, but with a leathery rind, of a deep golden color tinged with red, and contains numerous seeds coated with juicy, edible pulp.

POMEGRANATE

Pomerania (*pŏm'ĕ-rā'nĭ-a*) or **Pomm'ern,** a province of Prussia, bounded on the north by the Baltic Sea, on the east by western Prussia, on the south by Brandenburg and on the west by Mecklenburg. It is one of the lowest regions in Germany, and contains but few hills of even moderate height, but numerous lakes and ponds. The Oder divides Hither Pomerania (next Mecklenburg) from Farther Pomerania, the shore of the latter being lined with dunes. The larger portion of Pomerania is under tillage, the agricultural products being varied and numerous. To-day its area is 11,631 square miles, with a population of 1,716,481 Pomerania formed part of the territory of the ancient Vandals. When they moved south in the 5th century, it was occupied by Slavic tribes, one of which was called Pomerani. Hence the name of the region. The native princes assumed the title of duke in 1170, and joined the Holy Roman empire. The duchy was overrun by the imperialists in the Thirty Years' War, and they were followed by the Swedes, who established themselves in Hither Pomerania and some towns of Farther Pomerania. Not until 1815 was the last Swedish possession surrendered to Prussia. The capital is Stettin, population 236,145.

Pomona (*pō-mō'nă*), the Roman goddess of fruits and flowers. She was greatly beloved by a number of the rustic divinities, among whom were Sylvanus, Picus and Vertumnus. Propertius tells us that the last named, after vainly trying to approach her under various forms, at last succeeded by assuming the guise of an old woman; and, having awakened her feelings of pity, suddenly transformed himself into a blooming youth. In works of art Pomona is generally represented with fruits in her lap or in a basket and with a garland of fruits in her hair and a pruning-knife in her right hand.

Pompadour (*pôn'pà'dōōr'*), **Jeanne Antoinette Poisson,** Marquise de, the most famous among the mistresses of Louis XV, was born at Paris, Dec. 29, 1721. She possessed remarkable grace and beauty, and charmed every one with her wit and vivacity. In 1741 she married Le Normant d'Étioles, and soon became a queen of fashion in Paris. But this did not satisfy her, as her heart was set on becoming the king's favorite. At length she attracted his attention at a ball, and ere long she was established at Versailles with the title of Marquise de Pompadour. For twenty years she was almost the absolute ruler of France, the king being merely a spectator of his reign without even taking interest in it. She filled all public offices with her favorites, and made her own creatures ministers of France. Although her policy was disastrous and her wars unfortunate, she retained her position to the end by relieving the king of all business, by diverting him with private theatricals and even by consenting to his vices and immoralities. At last her nerves gave way under the strain and excitement to which she was subject, and after a sickness of twenty days she died on April 15, 1764.

Pompeii (*pŏm-pā'yē*), an ancient Italian city, near the mouth of Sarnus River and at the foot of Mt. Vesuvius, 13 miles southeast of Naples. It was founded by the Oscans about 600 B. C., and was afterwards occupied by the Etruscans and Samnites, the latter being dispossessed by the Romans about 100 B. C. From that time until its destruction in 79 A. D. it was a resort, frequented by the Roman aristocracy. In 63 its magnificent buildings were nearly all leveled to the ground by an earthquake, and some years elapsed before the citizens could be induced to return and rebuild them. Before this work was fully completed, Mt. Vesuvius (*q. v.*), whose volcanic fires had been slumbering for unknown ages, burst forth in a violent eruption, which buried Pompeii and Herculaneum under dense beds of cinders and ashes. Amid the deep gloom that covered land and sea the panic of the citizens was aggravated by repeated shocks of earthquake, and for three days the flight continued till Pompeii was abandoned by all who could effect their escape. By the fourth day the sun again became dimly visible, and the more courageous of the citizens began to return for such portions of their property as they could rescue from the ruins. The desolation and distress were so great that Emperor Titus organized relief on a grand scale, and even undertook to clear and rebuild the city. This attempt, however, was soon abandoned; and the unfortunate city remained a heap of hardened earth and ashes until its very site was forgotten, and even the celebrated topographer Cluverius was unable to fix it with certainty. This difficulty arose in large measure from the fact that the convulsions attending the eruption had turned the Sarnus from its regular course, and so raised the sea-beach that the ruins are nearly a mile from the coast. It was not until 1748 that an accidental discovery revealed that beneath the vineyards and mulberry grounds which covered the site lay the ruins of a city far more accessible, if not more interesting, than the previously discovered Herculaneum. Excavation proceeded fitfully until 1860, when the Italian government commenced unearthing the city in a systematic and scientific manner.

The general plan of the town is very regular, the streets being straight and crossing each other at right angles or nearly so. The streets rarely exceed 20 feet in width, the broadest yet found being less than 30 feet, while the back streets running parallel to the main lines are only about 15 feet. They are usually paved with blocks of lava fitted very closely together, and the marks of horses' hoofs and the ruts of chariot wheels are still plainly visible. The houses are generally low, rarely exceeding two stories in height. Not more than 300 skeletons have been discovered, chiefly in cellars and underground apartments. This fact makes it probable that most of the inhabitants escaped. The population probably was 12,000. See E. Neville Rolfe's *Pompeii Past and Present.*

Pom'pey the Great was born in 106 B. C., and at 17 fought with his father in the Civil War between Marius and Sulla on the side of the latter. When Sulla returned from Greece to Italy to oppose Marius, Pompey hastened into Picenum and raised three legions. With these he drove the soldiers of Marius out of the district, and joined Sulla. Soon after this he was sent to destroy the remains of the Marian or democratic faction in Africa and Sicily; and on his return to Rome was granted a triumph and honored with the title of *Magnus* or The Great. His next exploits were driving Lepidus out of Italy and fighting brave Sertorius in Spain. Pompey suffered a number of defeats, but was able to bring the conflict to a successful issue after the assassination of Sertorius. On his way back

to Rome he routed the remnant of the forces of Spartacus, and closed the Servile War. For this service he was awarded a triumph, while Crassus, who had defeated the main body of the forces of Spartacus, received only an ovation. Pompey was now the idol of the people, and, though legally ineligible to the consulship, he was chosen to that position, the senate removing his disabilities by a special act In 67–66 B. C. Pompey distinguished himself by clearing the Mediterranean of the pirates who had so long infested it; and during the next four years he conquered Mithradates, king of Pontus; Tigranes, king of Armenia; and Antiochus, king of Syria. On his return to Italy he disbanded his army, and in 61 B. C. entered Rome in triumph for the third time. Pompey now sought to have his acts in Asia ratified by the senate and certain lands divided among his veterans; and on that body refusing to accede to his wishes, he, in connection with Crassus, formed the alliance with Julius Cæsar that is known as the first triumvirate. For a time they carried everything before them, and the political alliance was made closer and stronger by the marriage of Pompey and Cæsar's daughter Julia. In 58 Cæsar (*q. v.*) led his army into Gaul, and for nine years Pompey idly wasted time and energies at Rome. Jealousies arose between the two; and after Julia's death in 54 Pompey returned to the aristocratic party which desired to check Cæsar's progress and, if possible, to strip him of his command. Civil war ensued, that ended with the battle of Pharsalia in 48 B. C., in which Cæsar was completely victorious over Pompey. Pompey fled to Egypt, and was treacherously murdered while landing. But Cæsar was so sincerely grieved that he caused the murderers to be put to death.

Pompey's Pillar, a celebrated Corinthian column standing near Alexandria in Egypt, on an eminence south of the walls. Its total height is 98 feet 9 inches, the height of the shaft being a little over 70 feet. The Greek inscription on the base shows that it was erected in 302 A. D. by Publius, prefect of Egypt, in honor of Emperor Diocletian; and it is supposed to record the conquest of Alexandria by Diocletian in 296 A .D.

Pon'ce is an important city in Porto Rico, the capital of the province of Ponce. It is the second largest city on the island and the first in commercial importance. It is well-built and modern in appearance, with macadamized streets, public plazas, churches, hospitals, theaters, an asylum, municipal hall and a number of handsome residences. It also has a public library and a good school-system established since the American occupation, in connection with which is conducted an industrial school with about 300 students. The water-supply is excellent, brought by an aqueduct three miles long. It has electric-light works and a street-car system which connects with Playa de Ponce, the port. The custom-house and the chief commercial houses are here. The harbor is large, is accessible to vessels drawing 25 feet, and is provided with wharves. The inhabitants engage chiefly in commercial and mercantile pursuits, but there are a few mechanical industries. The population in 1910 was 27,952 and that of the municipal district 55,477.

Ponce de Leon (*pŏn'thā dā lā-ōn'*), **Juan,** the discoverer of Florida, was born at San Servas, Spain, in 1460; was a court page; served against the Moors; and in 1502 sailed with Ovando to Hispaniola and became governor of the eastern part of the island. In 1510 he obtained the government of Porto Rico, and had conquered the whole island by 1512 when deprived of his post. He then, broken in health, set out in quest of the fountain of perpetual youth, and on the 27th of March, 1512, found Florida, landing a little north of where St. Augustine stands. He secured the appointment of governor of the country, and attempted to conquer his new subjects, but failed and lost nearly all his followers. He died in Cuba in July of 1521.

Pon'cho, an important article of male attire in Chile, the Argentine Republic and other parts of South America. It consists of a piece of woolen or alpaca cloth, six or seven feet long and three or four broad, with a slit of a foot or more in the middle through which the wearer passes his head, so that the poncho covers the shoulders and hangs down before and behind. Waterproof ponchos are worn by soldiers to a great extent, especially by cavalrymen.

Pon'doland, lying along the southeastern coast of South Africa, has been a part of Cape Colony since Sept. 25, 1894. It has an area of 3,918 square miles and a population in April, 1904, of 1,113 whites and 201,644 blacks, a total of 202,757.

Pontiac (*pŏn'tĭ-ăk*), chief of the Ottawa Indians, was born about 1712. In 1746 he defended Detroit, then a French settlement, against the attacks of hostile tribes, and he is also said to have led his warriors at Braddock's defeat in 1755. After the French had surrendered Canada, his hatred of the English prompted him to organize a combined attack upon all the English garrisons and settlements with a view to the extermination of what he called "those dogs dressed in red." The 7th of May, 1763, was selected as the day for the attack, which in most places was successful; but at Detroit, where Pontiac commanded in person, the commander was forewarned, and a five months' siege ensued. Pontiac resorted to every means familiar to savages to reduce the place, but was unsuccessful. Peace was finally made in 1766, Pontiac

being forced to submit to British rule. He was killed at Cahokia, Ill., by a drunken Indian in 1769.

Pon'tifex, the title borne by the members of one of the great religious colleges among the ancient Romans, the other being the college of Augurs. Although it is customary to speak of the college of pontiffs as a priesthood, it was not such, strictly speaking; that is, the members were not charged with the worship of any particular divinity nor did they conduct sacrifices. The duties of the pontiffs embraced the regulation of all religious rites and ceremonies of the state — how the gods should be worshiped, how burials should be conducted, how the *manes* (departed spirits) of the head should be appeased. In matters of religion their authority was supreme; there was no appeal from their decisions; and they themselves were responsible neither to senate nor to people. Their president was termed *pontifex maximus*. Their number, including the *pontifex maximus*, was originally five, all of whom were taken from the patricians. In 300 B. C. the Ogulnian law raised the number to nine, four of whom were to be plebeians. The first plebeian, however, who attained the dignity was Tiberius Coruncanius in 254 B. C. Sulla in 81 B. C. increased the number to 15, and Julius Cæsar to 16, he himself filling the position. During the empire the emperors generally discharged the functions of the position, but after the establishment of Christianity the title was assumed by the bishops of Rome, and the term pontiff is now one of the designations of the pope. The original Latin means the greatest or chief bridge-builder.

Pontine (*pŏn'tĭn*) **Marshes,** a low district forming the southern part of the Campagna of Rome and extending from Velletri southeast to the sea at Terracina. The length of the plain is about 28 miles, the breadth varying from 4 to 12 miles. The Appian Way was projected through this district in 312 B. C., and various plans were tried by the ancient Romans for draining the marshes, but with poor success. By the expenditure of some $2,000,000 Pope Pius VI during 1777-96 brought the Pontine marshes to their present state, in which a portion of the land is brought under cultivation, and other portions furnish pasture for horses, cattle and other animals. In 1899 the Italian government granted about 1½ million dollars for further drainage of the district.

Pontoon' (from *pons*, Latin for a bridge), boats connected together and stretched across a lake or stream to furnish a temporary bridge for the passage of an army. From the earliest times pontoon bridges have been used in crossing streams; and a pontoon train has become a necessity for every army manœuvering in a country where there are rivers too deep to be forded, many important campaigns having failed from lack of pontoons.

Pon'tus, the name given by the ancient Greeks to a country in the northeast of Asia Minor, bordering on the *Pontus Euxinus* (whence its name) and extending from Halys River in the west to the frontiers of Colchis and Armenia in the east. The name seems to have come into use after the era of Alexander the Great. See MITHRADATES.

Poo'na, a town in British India, situated on the Muta, 120 miles southeast of Bombay. Although the place abounds in beautiful gardens, the streets are mostly crooked and narrow and the houses poor. The city was the capital of the Mahratta princes, but was annexed by the British in 1817. Here have been built Decca College and the college of science, a normal school, a high school, and other educational establishments. Population with suburbs 171,000

Poor-Laws. The obligation of providing for the poor has been recognized by all civilized nations. Among the primitive peoples of the earth the giving of alms to those who were in need was inculcated as a religious observance, and ancient European nations regarded a provision for the poor as a matter of state policy. In early times Athens could boast of having no citizen in want, "nor did any disgrace the nation by begging." But war at length brought poverty, and the state decreed the maintenance of those who were wounded in battle and afterward of the widows and children of those who fell. There also were societies for the relief of distress among some of the Grecian states. Among the Romans the distribution of grain was introduced by Gaius Gracchus, and continued till the fall of the empire. In the time of Augustus 200,000 people were thus fed. Cicero mentions this provision of the Roman law as one in high favor with the people, since it furnished them abundant subsistence without labor; other Roman writers describe its results as injurious, creating a nation of idlers and mendicants and leaving the soil uncultivated.

In the middle ages the great body of the laboring classes were in a condition of serfdom, and looked to their feudal lords for support. But the church constituted herself the great receiver and dispenser of alms. The rich monasteries and abbeys distributed doles to the poor, as is still done at the mosque under the Mohammedan system. In most states of continental Europe the church remains to a greater or lesser extent the source of relief to the poor, the state only stepping in when the contributions of the church and of private charity are insufficient. In England the statute of 1388 is the first that makes provision for the impotent poor. Various statutes were passed after that time, culminating in the statute of

1601, which has formed the basis of the poor-law system of England to the present time. It taxed every inhabitant of every parish for the relief of the poor and directed the justices in every county to appoint three or four substantial householders in each parish to be overseers of the poor in connection with the churchwardens.

Various efforts were made to remedy abuses which arose under this system, of which the workhouse-system was one of the earliest. All who refused to be lodged in the workhouse were refused relief. But the act of 1796 repealed the workhouse test and allowed relief to be given in aid of wages, so that the poor-laws were practically turned into a mode of paying wages. Various changes were made from time to time, and finally in 1871 the poor-law board was abolished and its powers transferred to the local government-board. The fundamental rule in England and Wales is that each parish is bound to maintain its own poor, and this is done by a poor-rate which churchwardens and overseers may levy on all persons occupying land in the parish. In 1906 the poor-rates raised for the year, under the local-government act of 1894, amounted to £16,741,663.

In the United States a system of relief somewhat similar to that of England prevails in most of the states. Poor-houses are established by the county, to which persons unable to support themselves are transferred and cared for, such work as they are able to do being provided for them. In some states provision has been made for children's homes, where all children under a certain age, whose parents are dead or unable to provide for them, are fed, clothed and educated. Happily thus far the number of dependent persons in America is so small that the tax for their support is not seriously felt.

Poore, Benjamin Perley, an American journalist, was born at Newburyport, Mass., Nov. 2, 1820. He was apprenticed to a printer when a boy and grew up in a newspaper office. From 1838 to 1840 he edited *The Southern Whig* at Atlanta, Ga. He was sent with the embassy to Belgium in 1841 as an attaché, and remained in Europe seven years. While abroad, he collected valuable data for the archives of Massachusetts. He became editor of *The Congressional Directory* in 1867. He published a number of works, among which those most largely sold were the *Life of Zachary Taylor*, the *Conspiracy Trial for the Murder of Abraham Lincoln* and *Sixty Years at the Federal Metropolis*. He died at Washington, D. C., May 30, 1887.

Pope, a title first given to all bishops of the Christian church, but now exclusively applied to the bishop of Rome or head of the Roman Catholic church. Tradition, confirmed by the faith of the church, represents St. Peter as the first bishop of Rome Whether he were such or not, it was natural that the early bishops residing in the imperial city should acquire a large measure of influence and importance and that after the empire became Christian they should attain considerable temporal power. The temporal power was not fully established, however, until 754, under Pepin, king of the Franks. From that time the history of the papacy has been a contest of greater or lesser intensity with the princes and rulers of Europe, in which now one and now the other of the contending parties prevailed. At present the pope is stripped of all temporal power, but his authority over the church in all matters spiritual and ecclesiastical is supreme and unquestioned, the Vatican Council which assembled at Rome in 1870 having proclaimed his infallibility on all questions of faith and morals. Whenever a vacancy occurs in the papal chair, it is filled by the cardinals choosing one of their number to occupy the place. A history of the more important popes will be found under their several titles.

Pope, Alexander, English poet, was born at London, May 21, 1688, his father being a Roman Catholic and a man of means. Although Pope's early education was irregular and unsystematic, his father retiring from business soon after the son's birth, his application to study must have been close, for even in his juvenile poems are traces of profound thought. In 1711 Pope published his *Essay on Criticism*, which placed him at once in the front rank of the literary men of his day; and in 1712 appeared the *Rape of the Lock*, the most imaginative of his poems. Soon after appeared his translation of Homer's *Iliad*, which brought a fortune of $30,000. (See HOMER). A translation of the *Odyssey* followed a few years later, and in 1728 he issued the third volume of *The Dunciad*. The *Essay on Man*, published in 1734, is a didactic poem, and, although almost wholly deficient in the imaginative quality, is a masterpiece of wit and versification. Pope's command of terse and smooth expression is at its highest here; and it has been well said that this poem contains more familiar quotations than any other poem of equal length in the English language. Pope died at Twickenham, near London, May 30, 1744, leaving behind him a literary fame that has suffered no eclipse in over a century and a half.

Pope, John, an American general, was born at Louisville, Ky., March 16, 1822, and graduated at West Point in 1842, after which he entered the engineer-corps of the United States army. He served in the Florida War of 1842–44 and in the Mexican War, winning the rank of captain for his conduct at Monterey and Buena Vista. At the outbreak of the Civil War he was appointed brigadier-general of volunteers, and in the spring of 1862 distinguished him-

self by the capture of New Madrid, Mo., and Island No. 10 in the Mississippi. On account of these successes he was transferred to the east and placed in command of the forces formerly under Generals Fremont, McDowell and Banks, each of whom had been outgeneraled and beaten by "Stonewall" Jackson. He was defeated at the second battle of Bull Run, Aug. 29–30, 1862. He then requested to be relieved, and was transferred to the department of the northwest. Pope attributed his defeat to Gen. Fitz-John Porter (*q. v.*). In 1882 Pope was made a major-general in the regular army, and retired in 1886. He died while on a visit to the Soldiers' and Sailors' Home at Sandusky, O., Sept. 23, 1892.

Pop'lar, a species of the genus *Populus*, which belongs to the willow family. Characteristics are fluttering, shimmering leaves, whitish trunk, drooping catkins, cottony seeds. There are about 25 species native to the northern hemisphere, about half belonging to North America. The poplars may be divided in general into two groups: the balsam poplars with sticky buds and white poplars or aspens with buds not sticky. The common balsam poplar is *P. balsamifera*, sometimes also called tacaamhac. One of its varieties (*candicans*) is known as balm of Gilead. The common cottonwood or Carolina poplar is *P. monilifera*. The black poplar of Europe (*P. nigra*) is familiar in this country through its variety *italica*, which is the Lombardy poplar, probably of Asiatic origin. The common American aspen is *P. tremuloides;* the larger species being *P. grandidentata*, which is in cultivation in its "weeping" forms. A very commonly planted wild poplar is the abele of Europe, *P. alba*, which has leaves white cottony beneath. The name of poplar or white poplar has also been wrongly applied to a tree in a very different group, namely, the great tulip-tree (*Liriodendron*), which is closely related to the magnolias. It is this tulip-tree which yields the so-called poplar lumber of commerce. Of recent years poplar-wood has become valuable for paper-making.

POPLAR LEAF AND CATKIN

Pop'lin, a fabric of dry goods produced by weaving a weft of worsted yarn into a warp of silk. On account of worsted yarns being thicker than the silk, poplins always have a corded appearance. They may be either plain or figured, and used for dress goods, and for fine upholstery. The manufacture of poplin goods is of French origin, and was introduced into England and Ireland by Protestant refugees during the 17th century.

Popocatepetl (*pō-pō-kà-tā-pĕt'l*), a volcano about 40 miles southeast of the City of Mexico. It rises in the form of a cone about 17,000 feet above the level of the sea. Although smoke issues, no eruption has taken place since 1540. It is frequently scaled, and in its crater (nearly a mile in diameter and about 1,000 feet deep) much sulphur is found.

Pop'py, species of the poppy family (*Papaveraceæ*), but in the narrowest sense the name belongs to the genus *Papaver*, to which the opium-poppy (*P. somniferum*) of the Old World belongs. This poppy is largely cultivated in Europe and Asia for its capsule, from which the drug opium and the poppy-oil are obtained. It is a native of the Mediterranean region. Among the commonest native poppies are the argemones or prickly poppies, which are found in cultivation, and also occur over vast areas in the west. The common blood-root (*Sanguinaria Canadensis*) of the early spring also is a poppy, while the yellow or celandine poppy (*Stylophorum diphyllum*) is a well-known poppy of the early spring. The Californian poppy, with its pale, dissected leaves and long-stalked, brilliantly colored flowers, is *Eschscholtzia Californica*. It occurs in California in great masses, often giving most brilliant and variegated colors to a landscape. This poppy is extensively cultivated.

OPIUM-POPPY

Por'celain. See POTTERY.

Por'cupine, an animal with sharp spines or quills among the hairs. The Old-World porcupines are ground animals and live in burrows; those of the New World are mainly tree animals. They belong to the rodents or gnawing animals, feed upon bark of trees, and are often found around camps, attracted by salt and greasy leather or wood. The flesh is eaten by the Indians. The common Canadian porcupine has a stout

PORCUPINE

body, about forty inches long, with a short tail. The hair is dark brown, and the spines are from four to six inches long. They are almost hidden in the hair. It is found in New England, New York, Pennsylvania, Ohio and northward and northwestward. It should never be called hedgehog, for the latter is not a gnawing animal but an insect-eater, smaller, weaker and not found in America. Porcupines are slow-moving and slow-witted creatures. The idea that they can shoot their quills is a mistaken one, but when attacked they strike with the tail, and quills are thus driven into the disturber. When alarmed, the quills are raised erect, the animal presenting its bristling appearance. The tree-porcupine of tropical South America and Mexico is of slighter build, and has a tail capable of grasping.

Poros'ity, a term by which we express the fact that no body of matter, whether solid or liquid, completely fills the space it occupies, as the particles or molecules of all bodies have spaces between them filled with air, and these spaces are called *pores*. Many objects, as wood and cloth, show their porosity by the readiness with which they absorb water or any other liquid. Under heavy pressure water has been forced through iron, silver and other metals; and the porosity of water itself has been proven by mixing it with alcohol and noting the fact that the bulk of the mixture is much less than the sum of the two bulks before the mixture.

Porphyry (*pôr'fĭ-rў*), igneous rocks made of large and distinct crystals imbedded in a matrix of small and often indistinct crystals. The term also is sometimes applied to lavas, the matrix of which is but partly crystalline. The name, therefore, refers to the structure of the rock, not to its composition. A granite would be called porphyritic if some of its crystals, for example some of its feldspar crystals, were conspicuously larger than others. A quartz porphyry is one in which the conspicuous crystals (phenocrysts) are all quartz. Light-colored igneous rocks are more commonly porphyritic than dark ones.

Porpoise (*pôr'pŭs*), a sea-mammal belonging to the group of toothed whales. They are similar in general appearance to dolphins, but have a shorter snout. They are dark above and whitish below. Porpoises are common in the North Atlantic near shore, and often ascend rivers. They feed on such fish as mackerel and herring, for the capture of which their teeth are well-adapted. The bay-porpoise of the Pacific coast is the smallest of the whale family, being often not more than four or five feet long. Some other species reach a length of about nine feet. Their very thick hide is beaten down and made into soft leather. Their fat yields oil of fine quality.

PORPOISE

Port Ar'thur, called by the Chinese Lu-shun-k'ow, is a naval station on the northern coast of China, in the province of Shing-king, about 275 miles east of Peking. Up to 1881 it was merely a harbor of refuge for coastwise sailing vessels; but in that year China determined to make it a naval port for her northern squadron. It is entirely surrounded by hills; and at great expense it was fitted with dry docks, foundries for casting heavy ordnance and everything needful to constitute an important station. It grew from a mere handful of mud huts in 1881 to a place of 6,000 inhabitants in 1893. In 1894 it was destroyed by the Japanese as a result of the war with China. In 1898 Russia obtained a lease of this harbor for twenty-five years, subject to renewal; and with it was obtained possession of the adjacent seas and all the Chinese territory to the north. Port Arthur, though small, is naturally impregnable; and its many fortifications were made still more formidable by the Russian authorities. The acquisition of Port Arthur by Russia led to the occupation of Wei-Hai-Wei by Great Britain. In 1905 Japan captured Port Arthur from Russia after a long and terrible siege, and China, after the conclusion of peace between Japan and Russia, ceded Port Arthur to Japan. See CHINESE EMPIRE, JAPAN and RUSSIA.

Port Arthur, Can., a city on the western shore of Thunder Bay, in Lake Superior, Ontario. It is a divisional point on the Canadian Northern Railway and is the main line of the Canadian Pacific. It and Fort William (*q. v.*), twin cities almost joining, are at the head of lake-navigation. It, therefore, is a point of transhipment for much of the merchandise consigned by merchants east to the settlers on the western plains and for the grain from Canada's western wheat-belt, which is transhipped to the lake-vessels. The prosperous future of the west is assured, and therefore the location must bring prosperity to these twin cities. The elevators at Port Arthur will handle 9,000,000 bushels of grain. It is the terminus of the Northern Navigation Co., the Booth and White line and the Montreal and Lake Superior Steamships. Port Arthur has an extensive blast-furnace and immense docks; falls in its immediate vicinity can supply 150,000 horse-power. Its lumbering interests are very important. Population 12,862.

Port Arthur Ship-Canal, Tex., is an artificial waterway deriving its name from the town on Sabine Lake. This, which is three miles long and ten wide, marks the

boundary line of Texas and Louisiana; and narrows into a long channel, 7½ miles from Port Arthur, which is called Sabine Pass. This is 26 to 40 feet in depth and seven miles in length, terminating in the Gulf of Mexico and giving a shore-line of 14 miles for docks on the two sides. The width of the pass varies from one half-mile to a mile. At the outer end is a bar which has been pierced by a channel formed by extending, a mile or more from shore, two jetties of piled stone, which are built by the Federal government and are expected to cost $1,050,000. These jetties narrow the entrance from the Gulf; and the wash of waters, together with the incoming and outgoing tides, has scoured a channel over the bar from 16 to 25 feet deep. The bar has been the refuge of many vessels assailed by storms. The opening of the canal heralded the creation of a new seaport on the Gulf for the largest ocean-vessels, the connection of a land-locked, fresh-water harbor with the terminus of an 800-mile railway system and the reduction of 500 miles of the distance over which the exports of the southwestern states have been hauled east and west. The work was commenced in 1883, and the canal was formally opened on March 25th, 1899.

Port Dar'win, one of the finest harbors in Australia, is situated on the coast of the northern territory of South Australia, which is nearly 16 times the size of England. Its entrance is two miles wide, and vessels of any tonnage can sail in it with safety. Palmerston, the chief town on its shores, is the land-terminus of the overland telegraph and is the starting-point of a railway to the gold-fields of the interior, 150 miles distant. A telegraph runs from the north to the south of Central Australia, that is, from Port Darwin to Adelaide, the capital, a distance of over 2,000 miles. See AUSTRALIA.

Port Eliz'abeth, a seaport of the Cape of Good Hope, is on the western shore of Algoa Bay, 85 miles by rail from Graham's Town and 350 from Kimberley. Its public buildings are the town-house, the provincial hospital, churches, a college, a library, and a museum. The town was laid out in 1820, and in 1904 the population had grown to 32,959.

Port Hu'ron, Mich., a city, is on St. Clair River, where it issues from Lake Huron. The city has a fine custom-house, beautiful public library, shipyards, dry-docks, grain-elevators and large manufacturing interests, especially in engines and threshers, portable sawmills and corn-huskers. Both the car and locomotive works of the Grand Trunk Railway are in Port Huron and employ a large number of men. A submarine tunnel, the longest in the world, passes under St. Clair River, connecting Port Huron and Sarnia. Population 18,863.

Port Jer'vis, N. Y., village in Orange County, about 85 miles northwest of New York City. It is on Delaware and Neversink Rivers, and is served by three railroads. There are many waterfalls near, which furnish water-power and aid in the manufacturing industries. Chief among these are glove factories, a silk mill, necktie, overall, shirt and saw factories, a plating works, shoe-factory, flour and planing mills, a sash-factory and printing works. The principal buildings are the Y. M. C. A., the two hospitals, Saint Mary's Orphan Asylum, the Port Jervis Board of Trade and the free library. The village has good public and parochial schools, two private schools and a conservatory of music. Attractive scenery and beautiful waterfalls make Port Jervis a popular summer resort. Population 9,564.

Port Lou'is, the capital and principal port of the British colony of Mauritius (*q. v.*) in the Indian Ocean, is situated on the northwestern coast and is inclosed by a circle of lofty hills. It is a coaling-station of the British navy, and has barracks, harbor defenses and military storehouses. Population with suburbs 52,740.

Port Said (*sä-ēd'*), an Egyptian seaport town on the western side of Suez Canal, on a strip of land between Lake Menzaleh and the Mediterranean. The place was named after Said Pasha, the promoter of the canal, and depends wholly on trade, being mainly a coaling-station for steamers. Population 50,179.

Port Simp'son, the most northern port of British Columbia, has a fine harbor, and is one of the Hudson Bay Company's posts.

Portcul'lis, a strong timber or iron grating sliding up and down in the jambs of an entrance to a castle for the purpose of defending it from assailants. The lower ends of the vertical bars had spikes to stick in the ground or to injure those on whom it might fall. A powerful mechanism of windlasses was required to work the portcullis.

Por'ter, David, an American naval officer, was born at Boston, Mass., Feb. 1, 1780. He was appointed a midshipman in the navy in 1798 and lieutenant in the year after. At the beginning of the War of 1812 he was made captain, and captured the first British ship taken in the war. In 1813 with his *Essex* he nearly destroyed the English whale-fishery in the Pacific and took possession of the Marquesas Islands; but in March, 1814, his frigate was destroyed by the British in Valparaiso harbor, and he returned home on parole. He afterward commanded an expedition against the pirates in the West Indian waters, and was court-martialed and suspended from duty for six months for compelling the authorities of Porto Rico to apologize for imprisoning some of his officers. In 1826 Porter resigned from the navy and was placed for a time at the head of the Mexican navy. In 1829 he was appointed consul-general to the Berber states and, afterward, minister to Turkey. While acting

in the latter capacity, he died at Constantinople. March 3, 1843.

Porter, David Dixon, an American admiral, son of the above, was born at Chester, Pa., June 8, 1813. He accompanied his father on his cruise against the pirates in 1825, and for some time was a midshipman in the Mexican service. He entered the United States Navy in 1829, and after being employed on the coast-survey from 1836 to 1841 he became lieutenant, and served till 1845 on the Mediterranean and Brazilian stations, afterward returning to the coast survey. At the commencement of the Civil War he was appointed commander of the *Powhatan* and ordered to Pensacola; but afterward he was placed in command of the mortar-flotilla, with which, under Farragut, he successfully bombarded the forts of New Orleans. In 1863 he was placed in command of the Mississippi gunboats and rendered such signal service in the siege of Vicksburg (*q. v.*) that he was raised to the rank of rear-admiral. Transferred to the North Atlantic squadron, in December of the next year he bombarded and silenced Fort Fisher (*q. v.*), and in January, 1865, the place was captured by the combined action of the military and naval forces. At the close of the war Porter was made vice-admiral, and in 1870 succeeded Farragut as admiral. He died at Washington, D. C., Feb. 13, 1891.

ADMIRAL PORTER

Porter, Fitz-John, an American general, was born at Portsmouth, N. H., Aug. 31, 1822, and graduated at West Point in 1845. During the Mexican War he participated in the siege of Vera Cruz and in the battles of Cerro Gordo and Chapultepec. In the summer of 1861, having been appointed brigadier-general of volunteers, he was placed in command of a division of the army of the Potomac by General McClellan; and in the Virginia peninsular campaign he was placed in command of the 5th army-corps, distinguishing himself in the Seven Days' battles, especially at Malvern Hill. After McClellan's retreat his corps was ordered to re-enforce General Pope (*q. v.*) in his campaign against Lee and Jackson. On the 29th of August Porter received an order a short time before sunset to attack Jackson, which he did not obey. General Pope preferred charges against him, under which he was court-martialed and dismissed from the service. The justice of Porter's sentence was the subject of discussion for more than twenty years, and in 1886 he was restored to his rank of colonel in the United States army. He died in 1901.

Porter, Horace, an American soldier and diplomat, was born at Huntingdon, Pa., April 15, 1837, and educated at West Point. He served during the Civil War as chief of ordnance in the army of the Potomac and in the army of the Cumberland, and as aide-de-camp to General Grant in the last year of the war. He also was Grant's military secretary for a number of years and, later, his private secretary. He reached the rank of brigadier-general during his career in the army, from which he resigned in 1873. In 1897 he was appointed ambassador to France a position which he filled till 1905.

Porter, Jane, author of *The Scottish Chiefs* and other works, was born at Durham, England, in 1776, daughter of an army-surgeon who died soon after her birth. She was brought up at Edinburgh and London, and made a decided reputation in 1803 by *Thaddeus of Warsaw*, a romance which was followed by her most famous work, *The Scottish Chiefs*, in 1810. This work has a remarkable interest for youthful readers, and had the merit of inspiring Sir Walter Scott to write *Waverley*. She died at Bristol, May 24, 1850.

Porter, Noah, president of Yale College, was born at Farmington, Conn., Dec. 14, 1811, and graduated at Yale in 1831. After teaching for a number of years and taking a course in theological study, he became pastor of a Congregational church at New Milford, Conn., and afterward at Springfield, Mass. In 1846 he was elected professor of metaphysics and moral philosophy at Yale, and, after filling that position for 25 years, in 1871 he was chosen president of the institution, a position which he held until 1886. He died at New Haven, Conn., March 4, 1892. Among Dr. Porter's numerous works are *The Human Intellect*, *Books and Reading*, *Elements of Intellectual Science*, *Elements of Moral Science* and an edition of *Kant's Ethics*. He edited *Webster's Unabridged Dictionary* and *Webster's International Dictionary*.

Por'tia, the heroine in Shakspere's *Merchant of Venice*, is a rich heiress whose hand is to be bestowed upon the suitor who shall choose the right casket among three. The caskets are of gold, silver and lead respectively. Bassanio is the fortunate suitor who both wins the love of the lady and chooses the right casket. When Antonio, Bassanio's friend, becomes security for Bassanio's debt to Shylock, he falls into peril of his life, from which the brave and clever Portia rescues him by pleading his case in court in the guise of a young lawyer. Portia is one of the sweetest and noblest of Shakspere's heroines, and one of her speeches has become world-famous. It is that beginning

with the words: "The quality of mercy is not strained."

Port'land Ex'posi'tion, The, an international exposition held in Portland, Oregon, from June 1st to October 15th, 1905, to commemorate the one hundredth anniversary of the exploration of the northwest by Captains Meriwether Lewis and William Clark. The exposition derived its name from the city, the official title in full being The Lewis and Clark Centennial and American Pacific Exposition and Oriental Fair. It also is frequently referred to as the Lewis and Clark Exposition. The exposition was intended to tell the story, as the official title indicates, of the exploration and heroic achievement of a hundred years ago; of the development in a new-found land that gained the United States its western coast; and of the extension of American trade with the orient. As originally planned, only an exposition local to the northwest was contemplated; but, as the interest of the whole country became manifest, the scope of the undertaking broadened until it reached the proportions of an international exposition of the first rank. It was the first exposition of the kind ever held west of the Rocky Mountains. In natural beauty of setting it is considered by many to have surpassed all others. The national government contributed $470,000 in addition to contributing an exhibit, already prepared at a cost of more than $300,000; and nearly all foreign nations were well-represented. The unique feature was the Forestry Building, constructed entirely of logs of gigantic dimensions.

Portland, Me., largest city and chief port of entry in Maine, is situated on Casco Bay, about 60 miles from Augusta, the capital of the state, and about 100 miles from Boston. A number of islands in the bay are included in the corporation. The Grand Trunk Railroad and six other lines terminate at Portland, and regular lines of steamers connect the city with New York, Boston and other points on the Atlantic coast. The harbor, which is defended by five forts, is deep enough for vessels of all sizes and is seldom frozen. A large foreign trade is carried on with the West Indies and with European and South American countries, the imports and exports amounting to $15,918,492 in 1906. Portland was permanently settled by an English colony in 1632. Neal Dow, Longfellow, Thomas B. Reed and N. P. Willis were born at Portland, and William Pitt Fessenden lived there. In 1866 a destructive fire swept over the city, destroying property to the amount of $10,000,000, but the burned district has long since been rebuilt. Population 58,571.

Portland, Or., the largest city of Oregon, is on Willamette River, near the point where it joins the Columbia, about 100 miles from the ocean and about 800 north from San Francisco. The city is beautifully located on a rising slope that extends from the river to the foot-hills. Five snowcovered mountain-peaks can be seen from Portland Heights in the west of the city; and the public park-system embraces more than 200 acres. The public buildings are costly and modern, and among them may be mentioned the Public Library, the Chamber of Commerce, the Northwestern Industrial Exposition Building; the city-hall, postoffice and custom-house, each occupying an entire block; Union Depot, Marquam Theater, Weinhard Building and many others, besides fine private residences. At Oregon City, twelve miles from Portland, are Willamette Falls, which furnish excellent power for manufacturing. Among the industries are lumber and flour mills, furniture, cordage, boot, shoe, carriage and wagon factories, breweries, planing mills, paper-bag factories, saddlery and harness works, paint-works, spice-mills and canneries. Portland has an admirable public-school system, with fine schoolbuildings, and spends more than $250,000 annually for the maintenance of schools. Higher educational institutions include Portland University, Portland Academy, Bishop Scott School, Saint Helen's School for Girls and the medical and law schools of the University of Oregon. Among the charitable institutions are the Portland, St. Vincent's and Good Samaritan hospitals. Electric power from Willamette Falls operates the electric lights and street-railways. Portland has an immense drydock and is a prosperous port of entry, large ocean-ships coming to this point. Clearing-house returns for 1906 showed a commerce of nearly $300,000,000, with an export trade of $15,000,000. Portland was founded in 1844 by New Englanders who named it for the Maine city, and became a city in 1851. Population 207,214.

Portland, Isle of, a rocky island or peninsula in Dorsetshire, England, connected with the mainland by a long, narrow ridge called Chisel Bank. It is four and a half miles long, one and a half wide and nine to ten in circumference. The coast is rough and precipitous, the only landing place being on the north, opposite Weymouth. From its highest point the Verne (495 feet) presents an almost unbroken slope to Portland Bill, the southern extremity, where stand two lighthouses, showing fixed lights 210 and 136 feet above the sea. Between this point and the Shambles is a dangerous reef three miles southeast, while a surf, called the Portland Race, is raised by the impetuous tides. By the construction of a magnificent break-water over two miles in length, the building of which occupied twenty-three years, a harbor of refuge has been formed, affording anchorage for a large fleet of vessels. Population 11,000.

Portland Vase, a celebrated, ancient, Roman glass-vase or cinerary urn found during

the pontificate of Urban VIII (1623–44) in Monte del Grano near Rome. It was purchased by Sir William Hamilton in 1770, and a few years later by the Portland family, who deposited it in the British Museum. The vase was broken into pieces by a lunatic in 1845, but the fragments were skillfully united. It is ten inches in height and the finest known specimen of an ancient, cameo-cut glass.

Por'to Rico (*rē'kō*), a West India island formerly belonging to Spain, first settled by Ponce de Leon in 1510. It is about 100 miles in length and 36 in width, and is traversed east and west by ranges of mountains, from whose bases rich tracts of soil extend to the sea on all sides. Its estimated area is 3,435 square miles. Rain falls in much greater abundance on the northern than on the southern part of the island. The chief towns are San Juan the capital (48,716), Mayaguez (16,563) and Ponce (35,005). The total population of Porto Rico by census of 1910 was 1,118,012, about forty per cent being colored (including mestizos, negroes and a few Chinese). At the conclusion of the Spanish-American War in 1898 Porto Rico was ceded to the United States.

Government. According to the decision of the United States Supreme Court Porto Rico is a territory appurtenant and belonging to the United States, but not a part of the United States within the revenue-clause of the constitution. The island was given a civil government by Act of Congress of May 1, 1900. The governor is appointed by the president of the United States. The upper house consists of eleven members, six of whom are heads of departments, five are natives, and all appointed by the president. The lower house consists of 35 delegates, elected by the people for two years. The franchise is exercised under a property and educational qualification. By proclamation of the president on July 25, 1901, free trade was established between Porto Rico and the United States.

Education. In 1899 over 83 per cent. of the population could neither read nor write. A school-system was organized in that year; a general board of education and local school-boards were formed; suitable accommodations were required to be provided; and school-attendance was made compulsory. In 1911 there were 1,025 common schools open, with 128,453 pupils; 19 high schools with 1,144 enrolled, and a system of night schools and kindergartens. Many of the teachers in these schools are from the United States.

Commerce. In 1911 the imports amounted to $38,786,997, and the exports to foreign countries, $39,918,367. Value of shipments of United States merchandise to Porto Rico, $23,272,170, and shipments from Porto Rico to the United States, $26,391,338.

Resources. So far as developed, the chief products of the island are agricultural, including coffee, sugar, tobacco, bananas, pine-apples, oranges and vegetables. Some cotton is exported. With improved methods the yield can be largely increased. There is but little mining, though there are deposits of gold, silver, copper, iron, tin, mercury, platinum and nickel. There also are marble, gypsum and phosphates.

Ports'mouth, N. H., a city, on Piscataqua River, three miles from its mouth, and on the eastern division of the Boston and Maine Railroad. The United States Navy-Yard is on the opposite bank of the river, with facilities for docking the largest ships afloat and well-equipped shops and engineering plants. The city possesses the deepest harbor on the coast and important coastwise trade. The harbor never freezes. Portsmouth contains a superior line of stores and several important manufacturing interests. It is rich in historical memories, and possesses fine buildings and parks. The first settlement was made in 1623 by London merchants. The original charter, adopted in 1849, was amended in 1905 giving the city practically a new charter. The government is vested in a mayor and a council. The council elects heads of departments and subordinate officials. The city has waterworks, an electric-light plant and an electric street-car system, owning and operating the first. Population 11,269.

Portsmouth, O., county-seat of Scioto County, stands on the Ohio at the mouth of Scioto River, 100 miles above Cincinnati. It has iron-foundries, rolling-mills and manufactories, some of their products being stoves, ranges, cars, furniture, wagons and carriages, boots, shoes etc. The educational institutions are the public and parochial schools, several private schools, a public library and Peebles Reading-Room, besides charitable institutions and churches. The city owns and operates the electric-light and water works. Portsmouth has the service of three railroads and of steamboats to all Ohio River ports. Population 23,481

Portsmouth, the chief naval arsenal of Great Britain, is on the southwestern shore of Portsea Island, at the entrance to Portsmouth Harbor and opposite Gosport, with which it is connected by a steam-ferry. The fortifications comprise, on the landward side, the outer line of the Portsdown forts and the Hillsea lines; to seaward, the Spithead forts. Portsmouth Harbor, only about 400 yards wide at its entrance, expands into a spacious basin, extending inland about four miles and having a breadth of three miles along its northern shore. This harbor is situated in the middle of the channel, close to the anchorage of Spithead, where 1,000 ships of the line may ride without danger or inconvenience, and is under the shelter of the Isle of Wight. Opposite to it is

the French arsenal of Cherbourg. Population 217,989.

Portsmouth, Va., the capital of Norfolk County, on Elizabeth River, opposite Norfolk, with which it is connected by ferry. On the southern suburb of Portsmouth is the U. S. navy-yard, and on the northern suburb is the U. S. navy-hospital. Among the industries are cotton-mills, storage-plants and lumber-yards. Portsmouth is served by the Seaboard Air-Line; Atlantic Coast Line; Norfolk and Southern; and other railroads. Population 33,190.

Por'tugal, a kingdom in Europe on the western side of the Iberian peninsula, about 350 miles in length and from 70 to 140 in width. It is bounded on the north and east by Spain and on the south and west by the Atlantic. Total area (including the Madeiras and Azores) 35,490 square miles. The population increases steadily, but slowly. In 1851 it numbered only a little over 3,000,000; in 1874 it was over 4,000,000; and by the most recent census it was 5,423,132.

The most important mountain range is the Sierra da Estrella, a westward continuation of the Spanish Sierra Guadarrama system, and the Spanish Sierra Morena also continues westward in southern Portugal. Ocean-breezes temper the climate, and exempt it from the dry heat to which Spain is subject. The inequalities of surface, however, produce considerable diversities of climate; though snow falls abundantly on the mountains in the northern provinces, it is never seen in the lowlands of the southern districts, where spring begins with the new year and harvest is over by midsummer. The soil generally is fertile; but agriculture is in a backward state, little more than half the area being put to profitable use. The most prosperous branches of industry are the cultivation of the vine and the olive; from the former is derived the rich red wine, familiarly known as port from its being shipped at Oporto, "the port." The total quantity of wine annually exported from Portugal (chiefly to Brazil, England and the Portuguese colonies) amounts to 20,000,000 gallons. Fish abound in all the rivers and off the coasts; and of late years attention has been given to the cultivation of oysters. The manufacturing industries are chiefly concentrated in Lisbon and Oporto. About 455,296 persons are engaged in manufacturing pursuits, and nearly half of these are employed in weaving wool. In 1907 1,675 miles of railway were open, of which 580 miles belonged to the state. The exports average about $35,000,000 annually, and the imports are nearly twice that amount. The chief mineral products include copper precipitate and copper-ore, cupreous iron pyrites, ore for sulphur, lead-ore, anthracite and lignite. The national debt has increased from about $100,000,000 in 1853 to over eight times that amount in 1907. Every male Portuguese over 21 is liable to service in the army, the term being three years with the colors and nine in the reserve. On a peace-footing the army embraces about 30,000 men, the war-strength being about 175,380 men of all arms. The state religion is Roman Catholic, but toleration is extended to all creeds. Education is superintended by a council and is entirely free from the control of the church. Compulsory education was enacted in 1844, but is not generally enforced; and Portugal is far behind in education and intelligence. The one university, at Coimbra, established in 1290, is one of the oldest in Europe, and has 75 professors and 1,057 students. Lisbon has a learned society, the Academy of Sciences, and a public library of 250,000 volumes.

Portugal is a constitutional monarchy, the crown being hereditary alike in the male and the female line. The parliament or *cortes* is composed of the house of peers and the house of deputies. The house of deputies consists of 138 members, elected by the people, elections being held every four years. The Portuguese differ greatly from the Spaniards, whom they regard with no small degree of hatred, mainly on account of attempts of Spain to subvert the independence of Portugal in the past. Lisbon and Oporto in 1900 had a population, the former of 356,009 and the latter of 167,955; no other town in the kingdom reaches 30,000. The history of Portugal in ancient times and for several of the first centuries of our era was that of the Iberian peninsula as a whole; but in 1143 Alfonso I made it an independent kingdom. During the latter part of the 15th and the earlier part of the 16th century Portugal ranked as one of the most powerful monarchies in Europe, and Lisbon was the distributing center of the products of the east as well as one of the most important commercial cities. But it so declined and degenerated that in 1580 Philip II annexed it to Spain. It remained subject until 1640, when it succeeded in recovering its independence; and in 1668 its independence was formally recognized by the Spanish government. But in her conflicts with Spain and the Netherlands Portugal lost many of her colonies, and the nation which had once been the greatest maritime power on earth became one of the weakest and most insignificant. Under the reign of Joseph I his minister, Pombal (*q. v.*), sought to revive the national credit and restore the government to its former vigor and efficiency; but, when Joseph's daughter Maria became queen, all progress was arrested. The insanity of Maria led in 1799 to the establishment of a regency under her oldest son; and, when that prince learned that Napoleon had resolved on the extinction of his dynasty, he left Portugal in 1807 and transferred the government to Rio de Janeiro in Brazil (*q. v.*), which at that time belonged to Portugal. Even after the

French were driven out of Portugal and Napoleon's power was broken, John continued to reside in Brazil, leaving Portugal to be governed by English officers. This gave rise to such abuses and discontent that in 1820 a constitutional form of government was proclaimed at Lisbon in place of an absolute monarchy. John hurried home, but was immediately forced to sign the new constitution and to recognize the independence of Brazil. (See PEDRO I). On John's death in 1826 Pedro IV organized the government after the model of the English and renounced the crown in favor of his daughter. But in 1828 Miguel, Maria II's uncle, gathered a number of the clergy, army officers and old nobility and was proclaimed king by the Cortes. Then ensued a period of great confusion and misrule; but in 1834 Miguel was overthrown and renounced all pretensions to the crown. Maria II remained queen until her death in 1853, when she was succeeded by Pedro V, her son. Upon his sudden death in 1861 he was succeeded by Dom Luis, his brother, who continued to reign until succeeded by Carlos I, his son, in 1889. Carlos (*q. v.*) was assassinated on Feb. 1, 1908, and was succeeded by Manuel II (*q. v.*), his younger son who was deposed as the result of a revolution which ended in the establishment of a republic. The dependencies still owned by Portugal include Macao in China; Timor in the Malay Archipelago; the Cape Verd Islands; and those of Sao, Thomé and Principe; Portuguese Guinea, Portuguese East Africa; and Angola. See *Portugal*, in the Story of the Nations Series, by Morse Stephens.

Portuguese (*pōr'tū-gēz*) **East Africa** (*Estado d'Africa Oriental*) is bounded on the north by German East Africa, on the east by the Indian Ocean, on the south by Natal and on the west by Lake Nyasa, the British Central Africa Protectorate, which runs into Portuguese territory from the north and east as that territory projects itself from the south and west into British Central Africa, by Rhodesia, Matabeleland and Transvaal. Lourenço Marques is the capital. The territories directly administered by the state are divided into the districts of Mozambique, Tete, Quilimane, Inhambane and Lourenço Marques. The Manica and Sofala region is under the administration of the Mozambique Company, under a royal charter running from 1891 to 1941, by means of which the country along the Zambezi is settling rapidly, convenient river transport and facilities for mineral exploitation being secured. The country between Rovuma and Lurio or Luli Rivers and Lake Nyasa is similarly served by the Nyasa Company. The principal imports are cottons, iron-work and drink; the leading exports rubber, certain ores, wax and ivory Gold has been found at Manica, coal in Tete. The Delagoa Bay railway, 347 miles long, runs for 57 miles through the colony, on to Pretoria. The Beira railway runs 204 miles through the colony, and connects with the British line between Bulawayo and Salisbury. Another, from Lourenço Marques to Swaziland, is building, and part is already used. In 1903 there were 87 telegraph offices and 2,368 miles of line, Beira and Fort Salisbury, Lourenço Marques and the Transvaal and Quilimane and Chiromo being connected.

Portuguese Guinea lies on the Senegambian coast, enclosed entirely on the land side by French possessions, the Fuladugu country on the north and east and French Guinea on the south. It includes the neighboring archipelago of Bissagos, with the island of Bolama, on which is the capital of the same name, Bissao being the chief port. Its area is 4,440 square miles, and population (estimated) 820,000. The chief commercial products are rubber, wax, palmnuts, ivory, hides, oil and seeds.

Poseidon (*pō-sē'dŏn*), the Greek name for the mythical deity called Neptune by the Romans. He was said to be the son of Chronos (Time) and brother of Zeus. He was the husband of Amphitrite. As his portion of the universe he chose the sea; and to the Greeks, surrounded by the sea, he naturally figures much in literature and art. Under him are all other sea-divinities. The waves are his horses; the trident his scepter; and he is lord of storms and giver of calm. He usually is depicted riding in his chariot; Zeus, as sitting upon the throne.

Po'sen, a province of Prussia, bounded north by West Prussia, east by Poland, south by Silesia and west by Brandenburg. The province belongs to the great plain of northern Germany, and there are several lakes in the east. About 60 per cent. of the area (11,190 square miles) is arable land and under cultivation, the principal products being grain, potatoes and hops. Posen formed an integral part of Poland till 1772, when the districts north of the Netze were given to Prussia; to these was added, in 1793, Great Poland, except Masovia, the whole being incorporated under the name of South Prussia. In 1807 Posen was included in the duchy of Warsaw; but it was reassigned to Prussia by the Congress of Vienna in 1814 under the name of the Grand-Duchy of Posen. Population 2,099,831, of whom over half are Poles and the balance Germans.

Posen, the chief town of the province and a fortress of the first rank, is on the Warthe, 150 miles by rail from Berlin. In the 16th century it was an important trading mart, but before the end of the century it began to decline. The chief manufactures are artificial manures, agricultural implements, furniture and carriages. Population 117,034.

Post-Mor'tem Exam'ination (from *post*, Latin for after, and from *mors* or death). Examination of the body after death is a duty which has to be performed by physi-

cians in a variety of circumstances, of which the most important are cases of sudden and accidental death and cases of illness in which the nature of the disease could not be determined.

Post-Of'fice, the department of government whose business it is to convey letters, papers, books and parcels not exceeding 20 lbs. and maintain Postal Banks (*q. v.*). It is so called from the posts along Roman roads where couriers were placed for conveying news and dispatches. Other ancient countries had similar posts; but in all cases they were for government service only, the carrying of private letters or dispatches being no part of their duties. The beginning of a postal service in the United States dates from 1639, when a house in Boston was employed for the receipt and delivery of letters for or from beyond the seas. In 1672 the government of New York colony established "a post to go monthly from New York to Boston;" and in 1702 it was changed to a fortnightly one. A general post-office was established in Virginia in 1692 and in Philadelphia in 1693. A deputy postmaster-general for America was appointed in 1692; and by an act of parliament in 1710 he was directed to keep his principal office in New York, "and other chief offices in some convenient place or places in other of her majesty's provinces or colonies in America." The system, however, was a comparative failure until Benjamin Franklin became postmaster-general in 1753. Franklin filled this office until 1774 with such ability and efficiency that when he was removed the net revenue of the department exceeded $15,000.

In 1789, when the new Federal government was organized, the post-offices in the 13 states numbered only about 75. The following table will show the progress during a little more than the first century of our history:

Years	Offices	Revenue	Expenditures
1790	75	$ 37,935	$ 32,140
1800	903	280,804	213,994
1810	2,300	552,366	495,969
1820	4,500	1,111,927	1,160,926
1830	8,450	1,850,583	1,932,708
1840	13,468	4,543,522	4,718,236
1850	18,417	5,552,971	5,212,953
1860	28,498	8,518,067	19,170,610
1870	38,492	19,772,221	23,998,837
1880	42,989	33,315,479	36,542,804
1890	62,401	60,858,783	66,645,083
1899	75,000	95,021,384	101,632,160
1910	60,144*	183,585,005	190,238,288

Expenditures exceed the receipts. This is due to the fact that the postage on papers, books etc. is so low that they must necessarily be carried at a loss and also to improvements in the service from year to year. Some idea of the vast business may be obtained from the total number of letters, papers, etc., carried in 1912: 17,588,658,941 pieces.

*The decrease in offices is due to the introduction of rural free-delivery.

From the organization of the post-office department until 1816 the rate of postage on letters varied, according to distance, from eight to 25 cents. In 1816 these rates were so changed as to vary from 6¼ cents to 25 cents; and in 1845 the rate was reduced to five cents for each letter not exceeding one half ounce in weight and five cents for each additional half ounce or fraction thereof, carried under 300 miles; over 300 miles 10 cents. In 1851 the rate was made three cents for all distances under 3,000 miles, if prepaid, and five cents if paid on delivery. In 1855 a law was passed requiring all letters to be prepaid; and in 1863 the rate was made uniform to all offices in the United States; and by act of congress, approved March 3, 1885, the rate was reduced to two cents for each ounce or fraction thereof, carried to any part of the United States or territories. The same rate is charged for drop-letters where there is free delivery by carriers; where there is no such delivery, only one cent is charged.

Mailable matter is divided into four classes, of which letters and any matter sealed against inspection constitute the first. The second class embraces newspapers and all other periodicals issued regularly at least four times a year. The postage on this class is 1 cent per lb. when mailed by publisher or news agents, except that such periodicals may be sent to actual subscribers, living in the county where they are published, free of postage.

Third class matter includes books, and, in general, all printed matter, not issued periodically; it also extends to proof-sheets and manuscript copy accompanying the same and, in general, to any paper, cardboard or parchment on which an impression has been made by printing or other mechanical process, except the copying press or typewriter. The postage on matter of this class is one cent for each two ounces or fractional part thereof. The fourth class includes articles of merchandise and, in general, all mailable matter not belonging by its nature to either of the other three classes; but all matter included in this class must now be sent by PARCEL POST (*q.v.*). Matter belonging to the first, second and third classes may be registered on payment of ten cents in addition to the postage. In 1864 the money-order system was established at the leading post-offices, and has proved a great convenience. The following are the rates: For sums not exceeding $2.50, three cents; not exceeding $5, five cents, over $5 and not exceeding $10, eight cents; over $10 and not exceeding $20, 10 cents; over $20 and not exceeding $30, 12 cents; over $30 and not exceeding $40, 15 cents; over $40 and not exceeding $50, 18 cents; over $50 and not exceeding $60, 20 cents; over $60 and not exceeding $75, 25 cents; over $75 and not exceeding $100, 30 cents. A single

money-order may include any amount from one cent to $100.

An interesting feature of the money order system in this country is the fact that foreigners use it for banking purposes, purchasing money orders and keeping them instead of depositing their money in the bank. Since the establishment of postal savings banks this practice is becoming less common.

The one-cent postal card was first issued in 1873, large numbers of which are now used for brief communications. The two-cent card, with a reply-card attached for the return of an answer, was first issued during 1892.

In 1864 the free-delivery system was introduced into the larger cities, and it has since been extended to practically all cities having over 10,000 inhabitants or doing a post-office business of over $10,000. Provision has since been made for the extension of this system to villages and rural communities, and this has been accomplished to such an extent that there are about 43,000 rural free-delivery routes. Post-offices whose annual compensation amounts to $1,000 or more are divided into three classes, first, second and third, and are filled by presidential appointment; those whose compensation is less than $1,000 constitute the fourth class. All fourth class post offices were placed under CIVIL SERVICE (*q. v.*) by President Taft. The salaries of the postmasters appointed by the President vary from $1,000 to $6,000, according to the amount of business transacted. Salaries of fourth-class postmasters are derived from a percentage allowed on the cancellation of stamps, etc.

Foreign letter postage to Newfoundland, Canada, Mexico, Panama, Cuba, Great Britain and Ireland and to Germany (in direct steamers) is now two cents; to all other countries five cents.

POSTAL SAVINGS BANKS. Under an act approved June 25, 1910, postal savings banks were opened January 3, 1911, and were an immediate success, deposits reaching $25,000,000 by October 1, 1912. Any person, ten years of age or over, may begin with a $1 deposit or with 10 cents through a savings card system. Deposits are limited to $1 per month and to a total of $500. Annual interest of 2 per cent is allowed.

Potassium (*pō-tăs'sĭ-um*), a bluish-white metal discovered by Sir Humphrey Davy in 1807. It is the lightest of all the metals except lithium, and, as its specific gravity is only .865, it readily floats on water. In so doing it reacts violently with the water, forming caustic potash and giving off hydrogen, which ignites spontaneously from the heat of the reaction. At 32° F. it is brittle, like glass; at 59° it is soft and malleable; at 144° it becomes liquid. Potassium is widely diffused in the vegetable, animal and mineral kingdoms. Some of the more important potassium compounds are caustic potash (the hydroxide), the carbonate, the bicarbonate; also potassium chloride, bromide, iodide, nitrate (saltpeter), sulphate, chlorate, cyanide etc. Of these iodide, bromide and chlorate are used for medicines, the others being employed more or less in the arts.

Pota'to, the tubers of *Solanum tuberosum*, a genus of the nightshade family, which contains about 900 species, distributed almost everywhere, but most abundant in tropical America. Only about 25 species are found in North America. The potato, from which numerous cultivated varieties have originated, came from Chile, and is native in the mountains as far north as southern Colorado. The importance of these tubers as an article of food is well-known. It is sometimes called Irish or white potato, to distinguish it from the sweet potato, which belongs to a totally different plant The cultivated varieties of potatoes are exceedingly numerous, and additions to the list are being made yearly. That this tuber is a modified stem is apparent from the so-called "eyes," which are buds appearing in the axils of minute scales. As is well-known, these buds are able to develop into new plants, so that in planting the tubers care is taken in cutting them to include one or more eyes. In 1910 the acreage of potato-raising in the United States was 3,591,000 acres, and the value of the year's crop was estimated at $187,985,000. The total number of bushels in the gross yield was 338,811,000.

Potato-Bug or **Bee'tle**, a widely known beetle infesting potato-vines. In 25 years it spread from the Colorado region to the Atlantic coast and from Virginia to Maine. Up to 1859 this insect fed upon the sand-bur, a wild plant related to the potato, but about that year it began to appear upon the potato vine. It multiplied rapidly and migrated eastward, causing extensive destruction. The second word in its Latin name (*Doryphora decemlineata*) refers to the ten dark lines on the wing-covers.

The orange-colored eggs are laid on the underside of a leaf in a cluster of about 50. The dark-red larvæ hatch within a week, feed for two or three weeks, then crawl under rubbish or burrow into the soil and there pass the pupa state and remain about ten days. About a month after hatching the adult beetle appears. There are two or three broods a year, the last brood in the beetle state lying dormant in the ground during the winter. When warm weather arrives, the beetles come forth in great numbers and fall greedily on the young potato-plants. The pest is successfully combatted by sprinkling plants with paris green mixed with water; or by dusting with this poison mixed with flour or pulverized plaster in the proportion of one pound to 20, used after a shower or a heavy dew.

Potential (*pō-tĕn'shal*), a term employed in physics, astronomy and electric engineer-

ing. The region round any attracting body where work has to be done to carry mass from one point to another is known as a field of force. The potential at any point in such a field of force is the amount of work required to bring up a unit mass from infinity to that point. It is to be noted that nothing is here said as to the path by which this unit mass is brought up, for the work is the same whatever the path, provided the attraction obeys the law of inverse squares. This quantity was first introduced into physics by Laplace in his *Mécanique Céleste;* but the name, *potential*, is due to George Green (1828). The enormous importance of this quantity in electrical science will be appreciated best by reading some such treatment as J. J. Thomson's *Elements of Electricity and Magnetism.*

Poto'mac, a river of the United States, formed by two branches which rise in the Allegheny Mountains in West Virginia and unite 15 miles southwest of Cumberland, Md., from which the river flows southeasterly for 400 miles and empties into Chesapeake Bay, after forming an estuary 100 miles long and from two to seven wide. A few miles above Washington it forms a cataract 35 feet high. Between this and Westport it falls more than 1,000 feet. The scenery in this portion of its course is wild and beautiful, especially where it passes through the Blue Ridge at Harper's Ferry. The Potomac forms a great part of the boundary line between Virginia and Maryland.

Potosí (*pō'tō-sē'*), a city of Bolivia, South America, nearly 50 miles southwest of Chuquisaca (Sucre). It is built on the side of the Cerro de Potosí, 13,000 feet above the sea, and is one of the loftiest inhabited places on earth. The streets are too steep or narrow for wagons or carriages, and fully half of the town is composed of tottering and ruined buildings, uninhabited and desolate. There are considerable changes in the climate, but it generally is very cold, owing to the snow on the surrounding mountains, which scarcely ever melts. Yet Potosí is one of the principal commercial towns of South America, the industry of the place being limited to silvermining. As the country near Potosí is unproductive, all supplies have to be brought from a distance. The town was founded in 1545, and in 1611 had 160,000 inhabitants, but its population does not exceed 23,450. The department of Potosí is rich in minerals and cattle, and has an area of 48,900 square miles, with a population of 325,615.

Potpourri (*pō'pōō'rē'*), a mixture of sweet-scented flowers, dried and placed in a vase with a perforated lid, that their odor may be diffused through the room in which they are placed. But it also signifies a dish of different viands, and corresponds in this sense to the *hotch-potch* of Scotland and the *olla podrida* of Spain. In music the name is applied to a selection of pieces strung together without much system or arrangement — a sort of medley.

Pots'dam, the chief town of the Prussian province of Brandenburg and second residence town of the royal family of Prussia, is situated on an island beside Havel River, 16 miles by rail from Berlin. It is a handsome city, with broad streets, public gardens and fine squares, and in the neighborhood are more than half a dozen royal palaces. The manufactories include sugar, chemicals, harness, silk, waxcloth and beer. Flower-gardening, especially of violets, is an active industry. Alexander von Humboldt (*q. v.*) was a native of the place. Potsdam owes its creation as a town to Frederick William, the Great Elector, and to Frederick II. Prior to that period it was a fishing village on the site of an ancient Slav settlement. Population 62,224.

Pot'stone', a mineral composed of a mixture of talc, mica and chlorite. It is soft and easily cut when dug, but becomes hard after exposure to the air. It is made into pots and other utensils, which are cleaned by the fire. It was well-known to the ancients, and Pliny describes the manner of making vessels of it. It is quarried in Moravia, Norway, Sweden, Greenland and other countries.

Pot'tawat'tomies (signifying fire-makers), a tribe of North American Indians, belonging to the Algonquin stock. The early French settlers established a mission among them at Green Bay, Wis., and to this day many are Roman Catholics. They sided with the English during the Revolution and in the War of 1812, and afterwards settled in Kansas, where one band of over 400 now live in houses and cultivate the ground. Another band, 500 in number, is on a reservation in the same state, under the care of the Society of Friends.

Pot'ter, Paul, the greatest animal-painter of the Dutch school, was born at Enkhuizen in 1625, and was the pupil of his father, a landscape-painter, with whom he came to Amsterdam in 1631. He also was an excellent etcher and was so precocious that his best-etched pieces, *The Herdsman* and *The Shepherd*, were finished when he was only 18. He established himself at The Hague in 1649, but in 1653 he returned to Amsterdam. He died there in 1654, untimely. His *Dairy Farm*, measuring 48½ by 19½ inches, was sold in London in 1890 for $30,450, or $65 the square inch.

Pot'tery, all objects of baked clay. This art is of high antiquity, being practiced among various races in prehistoric times. We find mention of earthenware in the Mosaic writings. The Greeks had important potteries at Samos, Athens and Corinth, and attained great perfection as regards form and ornamentation. Demaratus a Greek, the father of Tarquinius Priscus,

Japanese potter at his wheel, fashioning fine Kyoto ware.

Hotozan, a famous porcelain worker, painting gems of art in his workshop at Kyoto.

Japanese girls, decorating fine pottery.

Firing cloisonne at Takatoni factory, Kyoto, Japan.

king of Rome, is said to have instructed the Etruscans and Romans in this art. The Arabs seem to be entitled to the credit of having introduced the manufacture of glazed ware into modern Europe. The Italians are said first to have become acquainted with this kind of ware as it was manufactured in the Island of Majorca, and hence they gave it the name of *majolica*. They set up

ETRUSCAN VASES

their first manufactory at Faenza in the 15th century. In Italy the art was improved, and a new kind of glaze was invented, probably by Luca della Robbia. (See ROBBIA.) The French derived their first knowledge of glazed ware from the Italian manufactory at Faenza, and on that account gave it the name of *faience*. About the middle of the 16th century the manufactory of Bernard Palissy (*q. v.*) at Saintes in France became famous on account of the beautiful glaze and rich ornaments by which its products were distinguished. A little later the Dutch began to manufacture at Delft the more solid but less beautiful ware which thence takes its name. The principal improver of the potter's art in Britain was Josiah Wedgwood (*q. v.*), in the 19th century. Porcelain or chinaware first became known in Europe about the end of the 16th century through the Dutch, who brought it from the East. In the United States the manufacture of pottery and porcelain is of recent development but has already attained considerable dimensions, the leading establishments being located at Trenton, N. J., and at Cincinnati, Akron and East Liverpool, O.

There are general principles and processes common to all kinds of pottery and porcelain. The first operations are connected with the preparation of the potter's paste, which consists of two different ingredients: an earthy substance, which is the clay proper, and a siliceous substance, which is necessary to increase the firmness of the ware and render it less liable to shrink and crack on exposure to heat. The clay is first finely pulverized and reduced to the consistency of cream, when it is run off through a set of wire gauze or silk sieves into cisterns, where it is diluted with water to a standard density. The other ingredient of the potter's material is usually ground flints or flint-powder, as it is called, which, treated in much the same way as the clay, is finally passed as a creamy liquor into a separate cistern. These liquors are now mixed in such measure that the dry flint-powder bears to the clay the proportion of one sixth, one fifth or even more. The mixture is then forced into presses, lined with cloth, by means of a force-pump, the cloth retaining the clay and allowing the water to escape. The clay now forms a uniform inelastic mass, which is cut into cubical lumps and transferred to a damp cellar, where it remains until a process of fermentation or disintegration renders it finer in grain and not so apt to crack in the baking. It is then subject to another operation, called *slapping* or *wedging*, which consists in repeatedly breaking the lumps across and striking them together again in another direction, dashing them on a board etc. This final process of incorporation is now most frequently performed by machinery.

In making earthenware vessels, if they are of a circular form, the first operation after the paste has been made is turning, technically called *throwing* them on the wheel.

Successive Stages of Earthenware Vessel on the Potter's Wheel.

This is an apparatus resembling an ordinary turning-lathe, except that the surface of the *chuck* or support for the clay is horizontal instead of vertical. The chuck in fact is a revolving, circular table, in the center of which a piece of clay is placed, which the potter begins to shape with his hands. The rotary motion of the table gives the clay a cylindrical form in the hands of the potter, who gradually works it up to the intended shape. It is then detached from the revolving table and dried, after which, if intended for finely-finished ware, it is taken to a lathe and polished. It is at this stage that the handles and other prominent parts are fitted on, which is done by means of a thin paste of clay called *slip*. The articles are now removed to a room in which they are dried more thoroughly at a high temperature. When they have reached what is called the *green* state, they are again taken to a lathe and more truly shaped as well as smoothed and burnished. When the articles are not of a circular form and, accordingly, cannot

be produced by means of the wheel, they either are pressed or cast in molds of plaster of Paris.

When shaped and dried, the articles are ready for the kiln, in which they are exposed to a high temperature until they acquire a sufficient degree of hardness for use. After the kilns have been allowed to cool very slowly, the articles are taken out, and, if they are not to be decorated in color, sometimes also when they are to be so decorated, they are immersed in a composition called *glaze*, which, after the vessels have been a second time subjected to heat, is converted into a coating of glass, rendering the vessels impermeable to water.

There are two methods of printing on earthenware: Press-printing, which is done on the bisque, and bat-printing, done on the glaze. In both cases an engraving is first executed in copper and thence transferred, by means of a sheet of paper containing an impression, to the article requiring to be printed; but the processes differ slightly in detail. When the vessel has received its impression, it is ready to be fired in the enamel kiln. Painting on earthenware is effected with a brush over the glaze.

Porcelain or chinaware is formed only from argillaceous minerals of extreme delicacy, united with siliceous earths capable of communicating a degree of translucency by means of their vitrification.

The processes employed in manufacturing porcelain wares are much the same as those for other earthenware, but they require more delicacy and care. Metallic oxides incorporated with some fusible flux, as borax, flint etc., are used for painting on porcelain. The colors are mixed with essential oils and turpentine, and applied by means of a camel's-hair brush. When the painting is finished, the vessels are baked in peculiar ovens called *muffles*, which are also used for fixing the printed figures on the glaze of stoneware. In order to secure the desired tint the baking must be stopped at precisely the proper time.

Potts'town, Pa., a borough in Montgomery County, on Schuylkill River and Canal and on the Reading and Pennsylvania railroads, 18 miles southeast of Reading and 40 northwest of Philadelphia. Here are the plants of the McClintock and Marshall Bridge Company and of the Pottstown Iron Company, together with many industrial establishments for the manufacture of nails, pig-iron, boilers, carriages, agricultural implements and cigars. It has some schools, including Hill School, churches, libraries, banks and other civic institutions. Population 15,599.

Potts'ville, Pa., a borough, the capital of Schuylkill County, on the river of the same name, in the rich anthracite regions, 35 miles northwest of Reading and 92 northwest of Philadelphia. It was at Pottsville furnaces that hard coal was first successfully used for smelting purposes in 1839; it continues to be notable not only as a shipping-point for anthracite but as an industrial center; there are rolling, spike and planing mills, stove foundries, nut and bolt factories, machine and engine shops, silk, skirt and stocking factories and breweries. Buildings of prominence are the county court-house, the jail, a public hospital and Pottsville Athenæum. There are a school library and a county law-library, an admirable public and parochial school-system and a commercial college. Pottsville has the service of three railroads. Population 20,236.

Poughkeepsie (*pô-kĭp'sĭ*), **N. Y.,** a city, county-seat of Dutchess County, is on the east bank of the Hudson, 65 miles by rail from New York City. The Hudson is crossed by a steam-ferry and spanned by a railroad-bridge of masonry, steel and iron. Poughkeepsie is the largest town between New York and Albany; its manufactures include machinery, ironware, boots, shoes, clothing, chairs, glass, wheels, boxes, horseshoes, underwear, knit-goods, agricultural machines and automobiles. It also has a rolling-mill and a blast-furnace. Two miles north is the state's hospital for the insane, which cost $750,000; but Poughkeepsie has chief reason to be proud of its educational facilities. Famous Vassar College is just beyond the eastern limits, and the town contains Riverview Military Academy, Eastman National Business College and a number of academies and seminaries, besides the public schools. Poughkeepsie is quite noted for its homes for aged people, among which are the Old Ladies' Home, Vassar Brothers' Home for Old Men, Pringle Home for Aged Literary Men, Gallaudet Home for Deaf-Mutes and St. Andrew's Novitiate. Poughkeepsie has the service of four railroads. Population 27,936.

Poul'try (Latin *pullus*, a chicken), birds domesticated by man, usually embracing chickens, ducks, geese, turkeys and guinea-fowl. From the time when men began to abandon their wandering mode of life and settle in fixed habitations poultry in some form or other has taken the place of the wild birds which they are no longer able to snare and kill. Poultry are raised for the food furnished by their flesh and their eggs. Their flesh enters largely into the food-supply, and is both healthy and nutritious. The production of eggs in the United States in 1908 was 1,293,662,433 dozen. In France, where poultry are bred to so great an extent, there are no poultry-farms, in the exclusive sense, but fowls are kept by every farmer and cottager. The same remark applies to Italy, Denmark and Ireland, all of which export large quantities of eggs and poultry. In the vinegrowing districts of France fowls are permitted to wander among the vines nearly all the year, and they do excellent

service in cleaning off insects as well as in manuring the ground. To make poultry profitable, they should be well-housed and well-fed, with sufficient space for obtaining gravel, grass, worms, garbage etc. Their houses should also be kept clean, as the richness of their manure makes the ground very foul. For laying-hens it has been found that sof food is very beneficial and that it should be given in the morning, with hard corn in the latter part of the day. Sitting hens should have a quiet nest, where they will not be disturbed during the 21 days required for incubation. Artificial incubation has been very largely adopted by poultry-raisers, most of the machines now sold working with great precision and regularity. The advantage of incubators is that they can be used at all seasons.

Pound, the English form of the Latin word, *pondus*, meaning weight, is now used in two distinct senses, *first*, a gold coin having the value of 20 shillings and, *second*, a standard of mass, equivalent to 7000. grains or 0.45359265 kilograms. The standard pound is not a "weight," but a "mass," and is kept at the Standard's office in London. The pound described above is the avoirdupois pound; the troy pound used only rarely by dealers in precious stones and metals has 5760. grains. The old English pound, which is said to have been the standard of weight from William the Conqueror to Henry VII, was derived from the weight of 7,680 grains of wheat all taken from the middle of the ear and well-dried. The pound weight of silver, the common money standard among the ancient Romans, was introduced by them into the countries which they conquered, and thus the term "pound" became the designation of a certain amount of coined money. The English pound is now considered as the simple equivalent in value of 20 shillings; but it originally denoted the actual pound of silver that was coined into 20 shillings. From the time of Edward II the coins were more and more diminished in size until the reign of George I, when the pound (in weight) of silver was coined into 66 shillings; and this rate still continues, the term "pound" meaning 20 of these shillings.

Pout'er. See PIGEON.

Pow'der, a general name for pulverised or minutely divided solid substances, has come to be specifically identified with gunpowder, a mixture of sulphur, charcoal and potassium nitrate. Gunpowder is now used in war far less than formerly, owing to the superior advantages of smokeless powders; but the production of it is considerable, and there is little likelihood that it will be superseded for such purposes as fireworks and military and naval salutes. The origin of gunpowder is obscure. The use of it for military purposes was suggested by Roger Bacon about 1266. But gunpowder was known in India and China, where saltpeter is very abundant, from time immemorial. Gunpowder was used in cannons as early as the battle of Crécy (1346). Its quality was very gradually improved. The French took the step, under the direction of Lavoisier, of carefully pulverising the ingredients in separate wheel-mills. It was gradually discovered that the quality and purity of the ingredients, especially the charcoal and niter, need careful attention. The niter is purified and transformed into small crystals by a process of boiling in water, filtration and rotation in crystallising vessels. Willow-wood is commonly used for charcoal. Even the sulphur has to be distilled and finely powdered. The proportion of the ingredients may vary; but in military powder it often is 75 parts niter, 10 parts sulphur and 15 parts charcoal. The greater part of the powder now produced in the United States is used, not for guns, but for blasting. See GUNPOWDER.

Pow'derly, Terence Vincent, an American labor-leader, who came into prominence as General Master-Workman of the Knights of Labor, was born at Carbondale, Pa., Jan. 22, 1849. He entered the employ of a railroad as a switch-tender at 12 and as a machinist at 19. He joined the Knights of Labor in 1874 and was elected mayor of Scranton in 1877 and 1878. He was raised to the chief office in the Knights of Labor at their meeting in Chicago in 1879, remaining master-workman until 1893. He studied law and was admitted to the bar in 1894. He was appointed commissioner of immigration by President McKinley in 1897.

Pow'ell, John Wesley, an American geologist and anthropologist, was born at Mount Morris, N. Y., March 24, 1834, and served through the Civil War, in which he rose to the rank of major. After holding a professorship in Illinois Wesleyan University for a number of years, in 1870 a survey of the Colorado and its tributaries was placed under his direction by act of Congress. His voyage through the canyon was a wonderful achievement. While engaged in this service he gave special attention to ethnology, and in 1879 was made director of the new bureau of ethnology; in 1881 he was also appointed director of the United States Geological Survey. Major Powell in 1886 received the doctorate of philosophy from Heidelberg and of laws from Harvard; and in 1887 he was president of the Association for the Advancement of Science. His works include *Explorations of Colorado River; Lands of the Arid Region; Contributions to American Ethnology;* and *Outlines of the Philosophy of the Indians.* He died on Sept. 23, 1902.

Pow'er, a term used in physics and engineering to denote the *rate of work*. When an engine hoists a carload of coal from the bottom of a pit to the surface of the earth, it

does the same amount of work whether the hoist be made in one minute or in one hour. Yet there is a very great difference between these cases; and we say that it requires a much more "powerful" engine to make the hoist in one minute. Accordingly, we define the *power* of an agent as the rate at which it does work, that is, the ratio of the work divided by the time. *Activity* is used as a strict synonym for power.

The *unit of power* most frequently employed in England and America is the horse-power, introduced by James Watt and defined as the activity of an agent capable of raising 550 pounds through a vertical distance of one foot in one second. The French horse-power is such that it will raise 75 kilograms one meter per second. In purely scientific work the unit of power is that which will accomplish the work of *one joule per second*. This unit is called a *watt;* and is numerically equal to 10^7 *ergs per second*. In electrical work the kilowatt (1,000 watts) is the unit most frequently used. Electrical energy, whether for lighting or for power purposes, is sold at so much per kilowatt-hour. It is important to remember that one horse-power equals 746 watts.

Powers, Hiram, a distinguished American sculptor, was born at Woodstock, Vt., July 29, 1805. While a boy he went to Cincinnati, O., and became an apprentice to a clock-maker. About the same time he formed the acquaintance of a German sculptor, who taught him to model in clay. In 1835 he went to Washington, where he executed the busts of several distinguished persons. Two years later he went to Italy to study his art, and resided in Florence until his death on June 27, 1873. There he produced his statue of *Eve* and numerous other works; but the famous production of his genius was the *Greek Slave*, of which six copies in marble and innumerable cast copies were produced.

Powhatan (*pou'hâ-tăn'*). See POCAHONTAS.

Pozzuoli (*pŏt'sŏŏ-ō'lē*), formerly Puteoli, a city of southern Italy on the Bay of Naples, seven miles from the city, with which it is connected by a tramway. Pozzuoli is interesting from its memorials of ancient times. Its cathedral was the temple of Augustus. There are the remains of an amphitheater which seated 30,000 persons, in which Nero fought as a gladiator; of temples to Diana and Neptune; and of the ancient harbor. Population 22,830.

Præ'tor, originally the official title of the consuls of ancient Rome as leaders of the armies; but specially employed to designate a magistrate whose powers were scarcely inferior to those of a consul. The prætor's functions were chiefly judicial, his principal business (although he sometimes commanded armies in the field) being the administration of justice in matters both civil and criminal; and to the edicts of successive prætors the Roman law owed much of its development. Originally there was but one prætor; but in 246 B. C. a second prætor was appointed to settle disputes that might arise between Romans and foreigners temporarily residing in Rome. In 227 B. C. two new prætors were appointed to administer affairs in Sicily and Sardinia. A few years later there were two for the Spanish provinces. Sulla increased the number to eight and Julius Cæsar to 16.

Præto'rian Guard, a special body of soldiers organized for protecting the person and upholding the power of the Roman emperors. We read of a select guard of soldiers attached to the person of Scipio Africanus, but it was by Augustus that they were first organized as a separate force. He formed nine or ten cohorts of 1,000 men each, but kept only three at Rome. Tiberius, however assembled the nine cohorts in a permanent camp at Rome, while Vitellius increased their number to 16. They soon acquired great power, which they often exercised most unscrupulously, elevating and deposing emperors at pleasure. Candidates for the imperial dignity found it necessary to bribe them largely; while those who attained the position were accustomed to purchase their favor by liberal donations. After the death of Pertinax (193 A. D.) they sold the imperial purple to Didius Julianus for a sum of money; but in the same year their organization was broken up by Severus, who formed new cohorts out of the best legions serving on the frontiers, which he increased to four times the number of the old ones. After several other changes the prætorian guard was finally dispersed among the other Roman legions by Constantine the Great in 312.

Pragmat'ic Sanc'tion, a solemn ordinance of the head of a kingdom relating either to affairs of church or to those of state. The term originated in the Byzantine empire, and signified a public and solemn decree by a prince, in distinction from the simple rescript, which was a mere declaration of law in answer to an individual. This name is applied to several important treaties, of which the chief ones are (1) that of St. Louis in 1269 and (2) that of Charles VII in 1437, in both of which the rights of the Gallican church were asserted; (3) the instrument which settled the Holy Roman empire in the Hapsburg house of Austria in 1439; (4) the ordinance by which Charles VI of the Holy Roman empire settled his dominions on Archduchess Maria Theresa, his daughter; and (5) the settlement of the succession of the kingdom of Naples, which was ceded by Charles III of Spain in 1759 to his third son and his descendants.

Prague, the capital of Bohemia and the third largest town in Austria-Hungary, is situated on the Moldau, 220 miles from

Vienna and 120 from Dresden. It has a picturesque appearance from the beauty of its site and numerous towers, more than 70 in number, which rise above the many noble palaces, public buildings and bridges. The fortifications have been gradually demolished since 1866. The university, founded in 1348, received a new constitution in 1881, and has two co-ordinate sides or sections, one German and one Czech, the former with 150 teachers and 1,534 students and the other with 173 teachers and 3,875 students. There also is a government technical high school, with 1,300 students and German and Bohemian teachers. The city has been ravaged by wars, and here peace treaties have been enacted, notably that of 1635 between Ferdinand II and the Elector of Saxony and that of 1866 between Prussia and Austria, when the latter ceded her rights in Schleswig-Holstein and paid a war indemnity of $15,000,000. Population 228,645.

Prai'rie (French for meadow), the name by which the French explorers called the vast, fertile and treeless plains between Ohio and Michigan on the east and the desert-plains on the west. They embrace the western part of Ohio, nearly all of Indiana, Illinois and Iowa, the southern part of Michigan, the northern part of Missouri and parts of Wisconsin, Kansas and Nebraska. At Cairo, Ill., they are from 400 to 550 feet above the sea, while near the center of the state they average from 650 to 750 feet, and in the northern part they are from 800 to 900 and even 1,000 feet. In southern Wisconsin the highest points are 1,100 feet above the sea, while near Prairie du Chien the prairies are only 400 feet high. In Iowa the prairie-tableland of Nicollet is from 1,400 to 1,500 feet above the sea, and divides the waters of the Missouri from those of the Mississippi. The prairies on the headwaters of the Illinois and Wabasn Rivers and south and west of Lake Michigan are called flat prairies, because very smooth and level, while the regions broken by depressions of streams are rolling prairies. Trees are seldom seen west of the Mississippi, and near the 98th meridian they disappear altogether. East of the Mississippi they are found in scattered groves along the streams or on low, rocky ridges. Prairies have almost no stones, the soil being a vegetable mold, black and very rich, producing wonderful crops of corn and wheat. The mound-prairies near Puget Sound and elsewhere along the Pacific coast are thickly studded with earth-mounds, from three to four feet in height and from 30 to 40 feet in diameter at the base. The vast plains between the 99th and 104th meridians and from Big Horn Mountains south to Llano Estacado are arid and partly desert, although by irrigation they have recently been developed into fertile fields.

Prai'rie-Dog, a species of marmot belonging to the ground-squirrel family. The animal is in no sense a dog. It inhabits burrows on the western plains and prairies, throwing up hillocks, which often cover a large territory, making a "village." On the approach of travelers the animals are seen perched, often erect, on their hillocks. They are sociable little fellows, fond of company and of light and air. In search of food they will wander a short distance from home, but are ever on the alert to scurry back and dive down into safety. Their enemies include coyote, gray wolf, fox, badger, black-footed ferret and birds of prey. Prairie-dogs abound in Montana, Wyoming and western Kansas; are found from Texas, New Mexico and Arizona northward; and on the western slope of the Rockies in Utah and Colorado. They feed on buffalo-grass, and, when very numerous, work much harm; and are a pest to farmer and ranchman. There are two species, one living east and one west of the Rocky Mountains. They are about a foot long, and their fur is of a pale chestnut-brown color. Their bark is explosive and sharp, like a small dog's. They prefer sandy or gravelly soil, and make underground galleries of great extent. The small burrowing owl and a rattlesnake have been found in their burrows, but it is not now believed that this association is from choice, nor is it harmonious.

Pratt In'stitute was founded in Brooklyn in 1887 by Charles Pratt, a successful manufacturer deeply interested in promoting industrial education. The Institute is liberally endowed and equipped with thirteen adequate buildings. It is divided as follows: The School of Fine and Applied Arts; School of Household Science and Arts; School of Library Science; School of Science and Technology; School of Kindergarten Training. The day work of the Institute has three distinct divisions: Normal; technical training for trade use; and technical training for home use. The evening work is provided for those whose regular occupation prevents them from attending a day course. The requirements for admission vary with the different courses. Requirements for admission to the normal classes are such as may be met by a four-year course in a good high school. Applicants for all normal courses except the kindergarten must be at least nineteen years of age; for that course, eighteen years of age. For most of the other courses the minimum age is sixteen, but the applicant must possess sufficient maturity of mind to be able to grasp the work of the course he desires to enter. The institute conducts courses in tanning and applied leather chemistry in cooperation with the National Association of Tanners. In this connection, research work of value to leather manufacturers is carried on. All the work of the shops in the School of Science and Technology is on a productive commercial basis, the commodities such as paint, soap and machinery being sold to firms ordering

them. The system of physical training is admirably adapted to suit the peculiar needs of the institution. No intercollegiate contests are allowed, but all sports are intramural. During the life of the institute, 100,000 have been enrolled. The institution is well endowed and possesses excellent workshops and laboratories. There is also a gymnasium and a large library which is free to the public.

Praxiteles (*prăx-ĭt'ē-lēz*), one of the greatest sculptors of ancient Greece. Of his life little is known, except that he was a citizen of Athens in the 4th century B. C. His principal works, most of which have perished, were statues of Aphrodite, Eros, Dionysius, Apollo and Hermes carrying Dionysius. Feminine beauty and Bacchic pleasures were his favorite subjects, and in his treatment of these he displayed the greatest sweetness, grace and naturalness. He has been justly called the sculptor of the beautiful.

Preces'sion, is the name given to that slow motion of the earth which causes the equinoxes to recede slowly along the ecliptic (apparent path of the sun around the earth), so that the sun comes to them in its annual revolution a little *earlier* than it otherwise would. The cause of this motion is the attraction of the sun and moon upon the protuberant part of the earth about the equator — the equatorial diameter of the earth being 26 miles longer than the polar diameter. The moment of force thus exerted tends to tilt the earth, which, like a top, "precesses" instead of falling over. As this disturbing force on the earth is very small relatively to its mass, this turning of its axis about the pole of the ecliptic takes place at about the rate of 50.1″ *per annum*, and it therefore requires 25,868 years for the equinoxes to describe a complete circle on the ecliptic. See EARTH, POLE-STAR and TOP.

Pre'cious Stones. See STONES, PRECIOUS.

Pre-Emp'tion. Under the laws of the United States, an actual settler on the public lands enjoys the right, in preference to any one else, of purchasing at a fixed price the land on which he has settled, to the extent of 160 acres. In the case of offered lands, the settler must file his declaratory statement within 30 days after entry, and within a year proof must be made of settlement and cultivation and the land paid for at $1.25 per acre if outside the limits of a railroad grant or $2.50 if within such limits. If the tract settled on is unoffered, an approved plan of the township must first be received at the district land-office; the statement must then be filed within three months; and final proof and payment must be made within 30 months thereafter. Title to land is thus obtained much sooner than under the homestead laws; but a homestead settler may at any time after six months purchase the land under the pre-emption laws; as, on the other hand, the holder of a pre-emption claim may convert it into a homestead. See HOMESTEAD LAWS.

Pre-Raph'aelitism, a term used by Holman Hunt, J. E. Millais and W. M. Rossetti, three English painters of the 19th century, to denote their predilection for the great masters before the time of Raphael, who studied nature rather than technical rules and dogmas. The three representatives of the pre-Raphaelite school appeared in the exhibition-season of 1849, Millais with *Lorenzo and Isabella*, Hunt with *Rienzi* and Rossetti with *The Girlhood of the Virgin*, and excited the most flattering attention; but numerous critics and enemies arose, and in the third year of its existence the new school was threatened on all hands with the most powerful opposition. Happily, however, there appeared in the London *Times* three letters from Ruskin, denouncing the spirit of jealousy and injustice with which the young men had been assailed and pointing out the merits of their works and the great influence for good which the revival of their principles was likely to have. There followed later a succession of pictures from the three artists, whose titles have become as familiar as household-words. See HUNT, MILLAIS and ROSSETTI.

Pres'cott, Ariz., a city, county-seat of Yavapai County, on the Santa Fé, Prescott and Phœnix Railroad, formerly was the capital of Arizona. It now is an important mining-center. Cattle and timber are also produced in the district. **Population, 6,000.**

Prescott, William Hickling, a distinguished American historian, was born at Salem, Mass., May 4, 1796, and graduated at Harvard College in 1814. During his college-course his left eye was put out by a piece of bread playfully thrown by a fellow-student, and the other eye was soon sympathetically affected, so that he was obliged to live for many months in a darkened room. He next traveled in England, France and Italy, married in 1820, and abandoned the study of law for literature, devoting himself to intense study, although able to use his eye only a portion of the time. His first studies were in Italian literature; and it was not until 1826 that he entered on the work of his life,—the study of Spanish history. After laboring with great patience for years, in 1838 he issued his *History of Ferdinand and Isabella*, which at once gave him a brilliant reputation in America and also in Europe, and was translated into French, Spanish and German. In 1843 he published *The Conquest of Mexico* and in 1847 *The Conquest of Peru*. In 1855 he published two volumes of *The History of Philip II*, but before the third volume was completed he died of apoplexy at Boston, Jan. 28, 1859. Prescott's style alone would have given him great popularity; and to this day he is without a rival for clear and vigorous narrative and sustained

power of color. He cannot be called a philosophical historian; modern investigation and discovery have corrected much in his picture of precolumbian American culture; but he is a master of narrative and incident, and there is not a dull passage in all his works. See his *Life* by George Ticknor.

Press'burg, a town of Hungary, stands on the left bank of the Danube, 40 miles by rail from Vienna and close to the Austrian frontier. Its principal buildings are the cathedral, in which the kings of Hungary used to be crowned, the town-house and the parliament-house. The chief manufactures are beer, dynamite, wire, starch, spirits and confectionery. Pressburg or, to give it the Hungarian name, Pozsony was a prominent town during the 11th and 12th centuries, and was frequently chosen for conferences and meetings between the rulers of Austria and Hungary. From 1541 to 1784 it was the capital of Hungary. Pressburg also is the capital of the province of Pressburg. Population of the city 65,867.

Pres'ident of the United States, the chief executive officer of the government, chosen by electors from the various states every four years. Nine presidents — Washington, Jefferson, Madison, Monroe, Jackson, Lincoln, Grant, Cleveland and McKinley — have been chosen for two terms; but a third term, although not prohibited by the constitution, is practically prohibited by the popular prejudice against it. Any native male citizen of the United States over 35 years of age is eligible to the presidency. The salary is $75,000 a year, but the president must receive no other emolument during his term from the United States or any state. In 1907 Congress appropriated $25,000 for his traveling-expenses. He is commander-in-chief of the army and navy; has the power to grant reprieves and pardons for offenses against the national or federal laws, except in cases of impeachment; and (by and with the advice and consent of the senate) makes treaties and appoints ambassadors, consuls and all United States officers not otherwise provided for. Every bill which passes Congress must have the approval of the president before it becomes law, unless two thirds of both houses pass it over his veto. The president administers the government through heads of departments, who are known as secretaries and constitute his cabinet. These officials are appointed by the president and confirmed by the senate. He also presents to Congress, when it assembles, a comprehensive statement of the affairs of the nation, with suggestions as to such matters as need its action. See UNITED STATES, DEPARTMENTS OF.

Presidential electors are chosen by the states, each being entitled to two electors at large and one for each congressional district, the total number at present being 531. A majority of all the electors chosen is necessary to an election of president and vice-president. If no candidate receive such a majority, the house of representatives must choose the president from the three highest numbers on the list, and the senate the vice-president from the two highest. In the election of president by the house the vote is by states, each state having one vote and a majority of all the states being necessary to a choice. The two presidents elected by the house of representatives were Thomas Jefferson in 1801 and John Quincy Adams in 1825.

The election of president and vice-president or, rather, the selection of presidential electors occurs every fourth year, on the Tuesday after the first Monday of November; and on the second Monday of January following these electors meet in the capitals of their respective states, cast their votes, and transmit the result to the president of the senate. On the second Wednesday of February the president of the senate counts these votes in the presence of both houses of Congress and announces the result. On the 4th of March thereafter the persons so chosen for president and vice-president are inaugurated for the term of four years. In case of the death or disability of the president the vice-president becomes president, and assumes all the duties of the office during the term for which he was chosen vice-president. If the offices of president and vice-president both become vacant, provision is made by law for filling the office of president from members of the presidential cabinet in the following order: (1) secretary of state, (2) secretary of the treasury, (3) secretary of war, (4) attorney-general, (5) postmaster-general, (6) secretary of the navy, (7) secretary of the interior and (8) secretary of agriculture.

The following is a list of the presidents of the United States, with the years during which they filled the office: (1) George Washington, 1789–97; (2) John Adams, 1797–1801; (3) Thomas Jefferson, 1801–9; (4) James Madison, 1809–17; (5) James Monroe, 1817–25; (6) John Quincy Adams, 1825–9; (7) Andrew Jackson, 1829–37; (8) Martin Van Buren, 1837–41; (9) William Henry Harrison, March—April, 1841; (10) John Tyler (chosen vice-president with Harrison), 1841–5; (11) James K. Polk, 1845–9; (12) Zachary Taylor, 1849–50; (13) Millard Fillmore (elected vice-president with Taylor), 1850–53; (14) Franklin Pierce, 1853–7; (15) James Buchanan, 1857–61; (16) Abraham Lincoln, 1861–5; (17) Andrew Johnson (elected vice-president with Lincoln in 1864), 1865–9; (18) Ulysses S. Grant, 1869–77; (19) Rutherford B. Hayes, 1877–81; (20) James A. Garfield, March—September, 1881; (21) Chester Allan Arthur (elected vice-president with Garfield), 1881–5; (22) Grover Cleveland, 1885–9; (23) Benjamin Harrison, 1889–93; Grover Cleve-

land, 1893-7; (24) William McKinley, 1897-1901; (25) Theodore Roosevelt (elected vice-president with McKinley), 1901-1909; (26) William Howard Taft, 1909-1913; (27) Woodrow Wilson, 1913-

Electoral votes allowed to each state since the apportionment act of 1911:

Alabama	12	Nebraska	8
Arizona	3	Nevada	3
Arkansas	9	New Hampshire	4
California	13	New Jersey	14
Colorado	6	New Mexico	3
Connecticut	7	New York	45
Delaware	3	North Carolina	12
Florida	6	North Dakota	5
Georgia	14	Ohio	24
Idaho	4	Oklahoma	10
Illinois	29	Oregon	5
Indiana	15	Pennsylvania	38
Iowa	13	Rhode Island	5
Kansas	10	South Carolina	9
Kentucky	13	South Dakota	5
Louisiana	10	Tennessee	12
Maine	6	Texas	20
Maryland	8	Utah	4
Massachusetts	18	Vermont	4
Michigan	15	Virginia	12
Minnesota	12	Washington	7
Mississippi	10	West Virginia	8
Missouri	18	Wisconsin	13
Montana	4	Wyoming	3
Total			531
Necessary to a Choice			266

See articles on each president named above and POLITICAL PARTIES.

Press. See PRINTING.

Press, Free'dom of the, is the right of every citizen to print whatever he chooses. The right, however, does not prevent his being amenable to justice for abuse of this liberty. In the early history of the press no such right was recognized, but the Roman Catholic church first originated censorship of the press. In 1515 that church formally decreed that no publication should be issued from any place over which it had jurisdiction without the written sanction of the bishop of the diocese. This policy of censorship was soon taken up by the civil authorities of the various states in continental Europe, and until very recent times it was an established rule that a free press was incompatible with an absolute government. While no censorship now exists in Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden or Switzerland, the press-laws in some of these countries are very rigid. In Spain, Germany and France the right is claimed and exercised of summarily suppressing publications deemed obnoxious to public peace and security. In France there is no constitutional guarantee in behalf of the freedom of the press. The constitutions of Switzerland and Prussia contain such guarantee, but empower the legislatures to place restrictions, which in some cases are very severe. In Russia the censorship of the press is still severe and arbitrary. In England, after a long and severe struggle, almost complete freedom of the press now prevails. Actual censorship was discontinued in 1694, but real freedom did not come for a century later At present the only restriction upon the English press, except in cases of libelous matter, is the common-law rule that the publication of anything against the constitution of the country or the established system of government is an indictable offense. The American colonies suffered with the mother-country, but after their overthrowing English authority the principle of freedom of the press was proclaimed, and incorporated in the first state constitutions; a rule which all succeeding states without exception have followed. This freedom of course carries with it a degree of responsibility for any abuse of such liberty, but this responsibility has not rested heavily on newspaper men. The great freedom with which newspapers criticise and often ridicule government officials, especially by means of pictures and cartoons, has sometimes led to something of a reaction in favor of more stringent libel laws. The constitution of the United States prohibits Congress from passing any law abridging the freedom of the press, yet there is one instance of such legislation.

Pres'sure, in physics and in engineering the force per unit-area which a fluid exerts upon any surface. To obtain the total force which a fluid impresses upon any given surface we have, therefore, only to multiply the average pressure by the area of this surface. In pure science the *unit of pressure* is that which exerts a force of *one dyne per square centimeter.* A larger and often more convenient unit is that adopted by the Paris congress of physicists in 1900, namely, 1,000,000 dynes per square centimeter. This unit practically is exactly represented by the pressure exerted by a column of mercury 75 cm. high at sea level at 0°C. This larger unit is called a *barye.* One barye=10⁶C. G. S. [centimeter-gram-second] units of pressure.

Pressure Gauge. See MANOMETER.

Preto'ria, the capital of Transvaal, formerly was the seat of government of the South African Republic, but was taken possession of by the British troops on June 5, 1900. It was named after Pretorius, the Boer leader. The town lies 1,000 miles northeast from Cape Town and 285 west from Delagoa Bay. It is connected with both by railways. Its white population was estimated at 10,000 at the outbreak of the war with Britain. It now is 29,660. See TRANSVAAL.

Pri'am, king of Troy at the time of the Trojan War, was the son of Laomedon and Strymo or Placia. The name means The Ransomed One, and was given on account of his having been ransomed by Hesione, his sister, from Hercules, into whose hands he had fallen. He was the husband of Hecuba by a second marriage, and had 50 sons, the best known of whom were Hector, Paris and Troilus, and a daughter named Cassandra. Priam is represented in Homer

as too old to take an active part in the Trojan War, and only once appears on the field of battle. The oldest Greek legends are silent respecting his fate; but later poets, like Euripides and Vergil, say that he was slain by Pyrrhos (Neoptolemos) when the Greeks stormed the city.

Pric'kle, a spiny outgrowth, such as those which occur on the stems of roses. They involve not merely the epidermis but more or less of the cortex beneath. See EMERGENCE.

Prim, Juan (*hōō-ān' prēm*), a Spanish statesman, was born at Reuss in Catalonia, Dec. 6, 1814. In 1862 he was appointed to the command of the Spanish forces sent to Mexico, but soon withdrew, his course being approved by the Spanish cortes when his reasons were given. He guided the movement that in 1868 overthrew Queen Isabella. In 1870 he selected Prince Leopold of Hohenzollern as Spanish king, which Napoleon III made the pretext for his declaration of war against Germany. But as Leopold declined the crown offered to him, Prim prevailed on Duke Amadeo of Aosta, son of King Victor Emmanuel of Italy, to accept it; but, on the day the new king landed in Spain, Prim was shot at Madrid by an assassin, and died on Dec. 30, 1870.

Prim'rose, a general name of species of the primrose family (*Primulaceæ*), but more specially applied to a species of the genus *Primula*, which includes about 150 species, most of which belong to the northern hemisphere. About 13 species are native to North America. The most common primrose of cultivation is the so-called Chinese

PRIMROSE

primrose (*P. sinensis*), a downy house-plant with enlarged calyx. The common English cowslip, whose cultivated varieties are known as different kinds of polyanthus, is *P. officinalis*. In the same family belong such forms as the beautiful American cowslip or "shooting-star" and the very similar cultivated *Cyclamen*.

Prince, a title given to the sons of kings, emperors and other rulers, sometimes with a territorial addition, as Prince of Wales or Prince of Orange. In various parts of continental Europe the title is borne by families of very high rank, but not possessed of sovereignty; but in England the term is restricted to members of the royal family. In a more general sense the word is often used for any ruler or sovereign.

Prince Albert, capital of the district of Saskatchewan, is 1,402 feet above the sea on the north branch of Saskatchewan River. It lies 249 miles north by rail and somewhat west of Regina on the Canadian Pacific Railway, 30 miles above the junction of the northern and southern branches of the river. Population 4,000.

Prince Edward Island, the garden-province of Canada, is a crescent-shaped island in the Gulf of St. Lawrence and snugly within the curve of the mainland of the two other maritime provinces. It is the smallest but most densely settled of the Canadian provinces. It is 140 miles long, and its width varies from two to 34 miles. The total area is about 2,184 square miles. The indentations of the coast are so numerous and great that no part is far from the sea. In 1534 Cartier called it a "low and beautiful land" — a fitting description, for the chief elevation is a chain of hills crossing it near the middle from New London Bay to De Sable. The sand-dunes, extending for forty miles along the coast, prevent the washing away of the land by the waves. The island, which owes its name to the Duke of Kent, is divided into Prince, Queens and Kings Counties. When laid out, each county was given a site for a capital, with two public domains called royalties and commons. Only two of these prospective towns, Georgetown in Kings and Charlottetown in Queens, became capitals, Summerside being the capital of Prince. The population in 1911 was 93,728— almost wholly of Canadian birth. People of Scotch and English origin predominate. Roman Catholics are the most numerous, then Presbyterians, then Methodists. The island is connected with the mainland during the summer by two steam-ferries, one between Summerside and Point du Chene (New Brunswick) and the other between Charlottetown and Pictou (Nova Scotia). Both tap the insular system of railways and meet spurs of the Intercolonial. In the winter two ice-breaking steamers keep these lines open. The Prince Edward Island Railway covers the island from end to end and taps all prominent towns. The summer climate makes the island a paradise for tourists. Atlantic fogs are practically unknown, because of the sheltering hills of Cape Breton and Newfoundland.

Agriculture is the chief industry, about 80 per cent. of the population being engaged therein. For the new world the province is thoroughly cultivated, 85 per cent. of its area being occupied. The fertile soil is easily enriched by sea-manures. The breeding of live stock for export is carefully fostered. Poultry is raised for the Sydney market,— a

noteworthy contrast to the day when the island fed the fortresses of Louisburg and Quebec. Now it feeds a coalmining city. The farmers' season is short but profitable. A provincial-government experimental farm has been established for half a century, and there are eight model orchards throughout the province. The fisheries (lobster, oyster and herring) are profitable. The Malpeque is the oyster of Montreal; it comes from Richmond Bay on the ocean-side of the island.

Educational advantages are excellent. Prince of Wales College and St. Dunstan College are important institutions and are affiliated with McGill and Laval. There is a free public-school system, the schools being supported both by local taxation and by government grants. Schoolhouses are seldom more than three miles apart, so well is the island supplied. Sir William C Macdonald of Montreal has established a consolidated school near Hillsborough, where among other things manual training, home-science and nature-study are provided. There also are Macdonald rural schools throughout the province. At Charlottetown there are the noticeably fine building of Prince of Wales College and Normal School, a government (undenominational) institution. Its diplomas are accepted at McGill (Montreal). The Roman Catholic College of St. Dunstan, which is affiliated with Laval, the Roman Catholic university at Quebec and Montreal, also is in Charlottetown. Charlottetown is the capital (population 12,000). It is situated on a fine harbor in the middle of the province. Summerside and Georgetown (winter-port) are the next in importance.

Prince of Wales is the title usually borne by the oldest son of a reigning sovereign of Great Britain. The monarchs of Wales (*q. v.*) during its independence were so designated, and upon its becoming a part of England the principality of Wales was bestowed by Edward I (1283) upon his son, afterwards Edward II. In 1343 the title was bestowed upon Edward the Black Prince, and from that time to the present the custom has been followed by each reigning sovereign of Great Britain. The title is not inherited but bestowed, and usually some time after the coronation of the sovereign. On the death of a Prince of Wales the title has been transferred to the next heir apparent, if a male. An annuity of $200,000 was settled upon the Prince of Wales by 26 Vict. c. 1. By statute the Prince of Wales becomes a Knight of the Garter as soon as he receives the former title. The particular badge of the Prince of Wales is a design of three white ostrich-feathers encircled by the ancient coronet of Wales and accompanied by the motto: *Ich dien* (I serve). This device is said to have been assumed by the Black Prince in 1346, when he took such a plume from John, King of Bohemia, whom he slew in battle. The origin of the motto has never been satisfactorily traced. See YORK, DUKE OF.

Prince Rupert on Kaien Island south of Port Simpson, British Columbia, has been selected as the Pacific terminus of the Grand Trunk Pacific (*q. v.*). The route round the world will be shortened by this road. It brings Liverpool nearer to eastern markets.

The Princess, a medley by Tennyson, is among his earlier productions and appeared in 1847. The story is a single one, told in blank verse in seven cantos with a prologue and a conclusion and with a lyrical song between each canto. A princess of the south has been betrothed to a prince of the north in early childhood. She, however, was not favorably inclined to the marriage when she had matured. She felt the call to something higher. Consequently she set up a women's college in entire isolation from the world, it being an inviolable rule that no man should ever enter The outcome of the story is that the college fails, the princess weds and thus illustrates that knowledge and high intellectual and esthetic ideals apart from real social life are impotent. A child is one of the potent means of arousing and bringing the princess to her true self The poem is a medley in that it unites in itself the medieval and the modern, the serious and the farcical, the congruous and the incongruous, the possibly real and the impossibly fanciful. The lyrics between the cantos are the most delightful parts of the poem, and critics are well-agreed that when *The Princess* has been forgotten these exquisitely beautiful songs will live. Aside from their own beauty, they assist in interpreting and predicting the meaning of the whole poem.

Prince'ton, N. J., a borough in Mercer County, 50 miles by rail from New York and about the same distance from Philadelphia. On January 3, 1777, it was the scene of a battle between the British under Colonel Mawhood and the Americans under Washington, in which the British were defeated. The place, however, is chiefly celebrated as the seat of the Princeton University and of Princeton Theological Seminary. Population, 7,864.

Princeton University, founded in 1746, at Elizabeth, N. J., as the College of New Jersey, removed to Newark in 1748, and to Princeton in 1756. Its name was changed to the present form in 1896. Its second president was Aaron Burr, Sr., and among other distinguished presidents have been Jonathan Edwards, John Witherspoon, Francis L. Patton and Woodrow Wilson. Nassau Hall, the oldest building, was a barracks and a hospital during the Revolution. The university consists of the Undergraduate Department, the School of Electrical Engineering, and the Graduate School. Besides 5 college fellowships and a number of graduate scholarships, there are 45 university fellowships and 172 undergraduate scholarships. Character-

istic of Princeton are, first, its coherent plan of undergradute liberal studies, based on prescribed fundamentals and providing increasing freedom for the student by a gradual opening of elective studies grouped in departments; second, its preceptorial method of undergraduate instruction, or teaching by means of small conferences on assigned reading; third, its student self-government as illustrated in the "honor system," and the senior council of undergraduate control; fourth, its communal and democratic undergraduate life in the dormitories, which is the chief source of the alumni loyalty, fifth, the higher intellectual life of the residential buildings of the graduate school.

Principe or **Prince's Island** is a Portuguese possession in the Bight of Biafra, due east of French Kongo. It forms an independent colony with São Thomé (*q. v.*). Its population is 4,327.

Print'ing is the art of producing impressions from characters and figures on paper or any other substance, but in this article it is confined to the art of making impressions with movable types, which may justly be esteemed among the greatest of human inventions. Notwithstanding the importance of this invention, it is not certain to whom the credit belongs, as it is contested by the Hollanders in favor of Laurens Coster (1423) and by the Germans in favor of Johann Gutenberg (1438). The most general opinion would seem to be in favor of Gutenberg, but it is not impossible that both made the invention about the same time, during the first half of the 15th century. Between 1450 and 1455 Gutenberg printed a Bible, copies of which are still in existence although exceedingly rare and valuable; and, besides this Bible, some other specimens of work from his press at Mayence (Mainz) have been discovered. The Dutch at Haarlem preserve and show similar specimens of early printing by Coster. Mayence, Haarlem and Strassburg certainly were the places where printing was done before the art extended to Rome, Venice, Florence and other European cities. The art was introduced into England in 1474 by William Caxton, who set up a press by Westminster Abbey. The first printing-press in the United States was set up in the house of the president of Harvard College at Cambridge, Mass., in 1639, and in 1674 another was established in Boston, after which other presses were gradually introduced throughout the colonies. Until the beginning of the 17th century the press used was a screw-press, with a contrivance for running the form of types under the point of pressure; force having been thus applied, the screw was relaxed and the form withdrawn, with the impression executed on the paper. The defects of this press were at length partially remedied by William Jansen Blaen of Amsterdam, who invented a press in which the carriage holding the form was wound below the point of pressure, which was given by moving a handle attached to a screw, hanging in a beam having a spring, which caused the screw to fly back as soon as the impression was made. This kind of press, which was mostly of wood, continued to be used until the beginning of the 19th century. The first improvement on this press was made by the celebrated Earl of Stanhope, who constructed a press of iron and applied such a combined action of levers to the screw as to secure easier and more efficient working. Numerous improvements succeeded, the screw being dispensed with, and the pressure being effected by levers. The chief among these was the Columbian press, invented by George Clymer of Philadelphia in 1818.

Meantime, in 1811, Frederick König, a German printer, had invented a press in which the impression was given by a cylinder, the inking being done by rollers and the paper being carried through the machinery on tapes. John Walter of the London *Times* was so favorably impressed with this method of printing that he engaged König to make a double cylinder-press which should print two copies of a form at each revolution of the cylinder, but only on one side of the sheet. This press, which was completed in 1814, made about 1,800 impressions an hour, and was the first printing-press in the world operated by steam. A few years later König invented an improvement on this press, in which the sheet, after an impression had been made on one side by one of the cylinders, was turned over to receive an impression on the other side by another cylinder; but the march of improvement did not stop here. The circulation of newspapers increased to such an extent that in 1855 Richard M. Hoe of New York brought out the rotary printing-press, in which the pages of type were placed on a horizontal cylinder revolving on its axis, against which the sheets were pressed by a number of smaller cylinders, which were so arranged in a framework as to require a feeder for each one of these smaller cylinders. Such a press with six cylinders, each making 2,000 impressions an hour, could turn out 12,000 sheets, printed on one side, in an hour, and those with eight and ten cylinders in proportion. But the Hoe machine, with all its advantages, printed only one side at a time, and between 1863 and 1868 the Walter press was devised, by which printing is done from a continuous roll of paper, which is printed on both sides from stereotype plates, cut in separate sheets and pasted. This press, when first introduced, printed from 12,000 to 15,000 sheets per hour; but since that time many other web-printing presses have been introduced, by which sheets of four pages are printed at the rate of 50,000 or more an hour. By the introduction of steam-presses the trade of the printer has

undergone a remarkable revolution in the past century. Though fewer hands are needed for working the presses in proportion to the amount of printing done, the increase of employment to compositors, bookbinders etc. has been very great. The manufacture of printing-machinery, as well as the manufacture of paper, has itself become a great industry, and no one can safely predict what progress will be made in this field during the 20th century. See *The American Dictionary of Printing and Bookmaking.*

Prism, an optical instrument composed of two plane, refracting surfaces. The angle between these two planes is called the refracting angle of the prism. Since in any kind of matter, except ether, lights of different color travel with different speeds, it follows that lights of different color will each have a different direction impressed upon them on passing through a prism. A prism thus produces "dispersion" in a beam of white light and is used, therefore, in the spectroscope to separate the various colors which compose the incident beam. Any transparent material whose refractive index is desired is generallly cut in the form of a prism; for on measuring the angle of deviation for any ray, call it D, and the refracting angle of the prism, which we may call A, we have the following relation:

$$\text{Refractive index} = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

See LIGHT, LUXFER PRISM and SPECTROSCOPE.

Pris'oners of War are persons captured from the enemy during military or naval operations. In ancient times the tr atment of prisoners of war was very severe, it being no uncommon thing to put the population of a conquered city or state to the sword or to reduce them to slavery. Although the practice of putting prisoners to death became less frequent as the principles of Christianity became more widely diffused, they and their families were commonly reduced to slavery as late as the 13th century. By degrees the more humane custom of exchanging and paroling prisoners was adopted, although in all wars there still is more or less of suffering among prisoners.

Pris'ons, strange to say, are a development of civilization, and also of personal liberty. The abolition of slavery and the decay of the feudal system made it necessary in all countries to take the punishment of crime out of private hands and turn the offender over to the power of the state. In the exercise of this power governments have punished their subjects by death, direct torture, transportation, exposure in the pillory etc. All these, except death, have been abandoned by most of the civilized nations; and in all of them death is inflicted only for the most serious offenses, and, as a consequence, imprisonment for a greater or lesser period is resorted to as a means of protection to society. How crudely, how barbarously, this power has often been exercised has in part been revealed to the world. If the whole story could be told, how dark would be the picture! It is a relief to turn from the contemplation of the miseries and horrors of prison-life to the efforts that are being made by prison-reformers throughout the world to reduce prison-discipline to a humane system and make it a means of reformation to the prisoner as well as a means of protection to the public. The prisons of the world are yet very far from perfection; but in every civilized nation there are earnest men and women studying all the questions connected with prison-reform, and the results already are seen in a more intelligent and Christian system of discipline. In the United States, especially, our jails and penitentiaries have been relieved of many degrading features. and in a number of the states reform-schools have been established for juvenile offenders. In 1877 New York established a reformatory at Elmira for the reception of all prisoners under 30, in which, while strict order and discipline are maintained, the inmates are carefully trained and educated and encouraged to earn a parole and even a discharge by good conduct and thorough reformation. In Ohio, in addition to a reform-shool for girls at Delaware and a reform-farm for boys at Lancaster, an intermediate penitentiary has been established at Mansfield, which is conducted after the manner of Elmira Reformatory. Similar steps have been taken in other states. See *The State of Prisons in the Civilized World* by Wines.

Pri'vateer, a ship owned by a private individual or by a number of individuals, which, under letters of marque (*q. v.*), makes war upon the shipping-commerce of a hostile power. Privateering was abolished among European nations, except Spain, by the treaty of Paris in 1856; but the United States never signed this agreement. During the War of 1812 and to some extent during the Revolutionary war British commerce suffered severely at the hands of American privateers, there being over 200 of these afloat during 1812–14. In the Civil War the Confederate privateer, *Alabama,* captured a considerable number of United States merchant-vessels, for which England afterwards paid damages for allowing a privateer to depart from one of her ports. By act of congress, passed in 1864, the entire proceeds of a prize taken by a privateer go to the captors, unless otherwise provided and specified in the ship's commission, the sum awarded being divided equally between the ship's company and her owners. See ALABAMA CLAIM.

Priv'y Coun'cil, an institution peculiar to the English government, having its origin in feudal times, when it was the custom of the sovereign to summon his barons and nobles to give him advice in matters of state. The list of privy councilors includes, besides the prime minister and members of the cabinet, the archbishops of Canterbury and York, the bishop of London, the lord chief-justice of England, the lord-chancellor and numerous dignitaries. In ordinary cases only the cabinet ministers, the great officers and the archbishop of Canterbury are summoned to the meetings, but in extraordinary cases the whole body is summoned. In theory the cabinet is only a committee of the privy council, but, in fact, power is exercised by the cabinet alone, and the privy council is only occasionally or rarely consulted. The privy council cannot, however, be truthfully described as dead or obsolete, as it still exercises important powers in special cases. In 1788 it took on itself the duty of inquiring into the sanity of George III, and in 1821 it determined the constitutional question of Queen Caroline's right to be crowned as queen-consort. Still, in a general sense, it may be described as a reserve force, kept apart from the active and working forces of government.

Proa (*prō'ä*) is a peculiarly shaped canoe used by the natives of the Malay Archipelago and on the China Seas, especially by the Ladrone Islanders. It is about 30 feet in length by three in width, and has the stem and stern equally sharp, so as to change its course without being turned around. One side is flat and in a straight line with stem and stern; the other side is rounded like an ordinary boat. This peculiar formation would make it easy to upset, were it not for a framework which projects to windward and supports a weight which counterbalances the great pressure of the wind on the sail.

Proc'ter, Bryan Waller ("Barry Cornwall"), was born at London, Nov. 21, 1787. Educated at Harrow with Byron and Peel, he came to London when about 20, and soon began to contribute poetry to *The Literary Gazette.* A few years later he published four volumes of poems, and produced a tragedy at Covent Garden Theater, whose success was largely due to the acting of Macready and Kemble. He was a metropolitan commissioner of lunacy from 1832 to 1861, and died on Oct. 4, 1874. His works, issued under the pseudonym of Barry Cornwall, comprise *Dramatic Scenes, A Sicilian Story, Marcian Colonna, The Flood of Thessaly* and *English Songs,* besides *Memoirs of Kean* and *Charles Lamb.* See *Bryan Waller Procter, an Autobiographical Fragment,* edited by Coventry Patmore.

Proctor, Richard Anthony, a distinguished English astronomer, born at Chelsea, March 23, 1837, and educated at St. John's College, Cambridge, where he graduated in 1860. In 1865 he published an article on double stars in the *Cornhill Magazine,* and from that time wholly devoted himself to astronomy. He came to America on lecturing tours in 1873 and 1875, and succeeded, as in England, in interesting large numbers of people in astronomy. He died at New York, Sept. 12, 1888; and in 1890 a memorial observatory was erected in his honor near San Diego, Cal. Among his works are *Half-Hours with the Telescope, Old and New Astronomy* and *Myths and Marvels of Astronomy.*

RICHARD A. PROCTOR

Progressive Party, formed in Chicago in 1912, when the Republican presidential convention refused seats to delegates pledged to nominate Roosevelt. A later Progressive Convention nominated him on a platform pledging direct primaries, initiative, referendum, recall, woman suffrage, numerous industrial and other reforms. The Progressive Convention of 1916 voted to support Charles E. Hughes, the Republican candidate.

Project'iles, all objects thrown forward by quick impulse for any purpose. Projectiles have been used in offensive warfare from very early days. At first they consisted simply of stones, arrows, darts etc., which were thrown from the hand or by some simple device, as sling, ballista, bow or catapult. Gunpowder came into use about the middle of the 14th century, and the invention of guns immediately followed. With the invention of guns, arrows and darts largely passed out of use, but stones continued to be used for more than five centuries and for more than a century they constituted the chief material for projectiles. They were made to fit the gun loosely, were often smoothly and neatly cut, usually being spherical though sometime oblong. Bags of small pebbles were sometimes used. Iron came into use in the 15th century. At first wrought-iron was used. The use of cast-iron marked a decided advance. Lead has been used from an early date, but only for case-shot and small arms. The first guns made were smooth-bore and muzzleloading and it was not until the middle of the 19th century that rifled breechloading guns were successfully used. Projectiles may be divided into two general classes; spherical and oblong. Spherical projectiles were used almost exclusively in smooth-bored guns and with them have about passed out of

use. Chain-shot, bar-shot, carcass and light-ball are other varieties which are now obsolete. There are three varieties of the oblong projectiles: the solid shot, the hollow shot or the shell and the case-shot. The hollow shot contains some explosive which, at some point in its course, is ignited by a fuze or other means. Case-shot comprise grape-shot, canister and shrapnel, and are used against animate objects. Oblong projectiles have many advantages over spherical projectiles. They are in use confined to rifled guns.

Prometheus (*prō-mē'thūs*), a hero of Grecian mythology, who, on account of various services rendered to men, was chained by Zeus to a rock, where a vulture was sent to devour his liver by day, Zeus causing it to grow again by night. As Prometheus continued to endure this torture without yielding, the wrath of Jupiter was at length appeased, and the victim was released. Some legends represent the offense of Prometheus as stealing fire from heaven for the benefit of men; and in the tragedy of Æschylus he is an immortal god, a friend of the human race, who does not shrink from opposing the evil designs of Zeus against mankind nor even from sacrificing himself for their salvation. The possession of fire was very important to the early races of men, and the legend of its having been originally stolen from heaven is very widely spread over the world.

Proof'-Read'ing. Owing to the varieties of handwriting which are submitted to printers, as well as to various accidents which cannot wholly be avoided in setting up type, it is necessary that the first imprints or proofs of a book or periodical should be carefully revised and corrected Moreover, an author or editor is by this means enabled to make alterations or corrections in the text to the last moment. Among the errors for which proof-readers will be on the alert are these: the omission of letters or their wrongful insertion; bad spacing between words or letters; the omission of words; the transposition of letters, words or phrases; wrong type; defective punctuation and use of capitals; crookedness of lines. For these faults the proof-reader uses certain appropriate marks. It is not, however, necessary to adhere to these marks alone. Every proof-reader should, however, make his corrections in the margin and on the side nearest the error. He should set a vertical stroke at the end of each correction in the margin. The spot at which the correction is to be made should also be indicated. The purpose of the vertical stroke after each marginal correction is to separate one correction from another, for it is not uncommon to find several fall close together, even in the one line. Thus a wrong letter would be corrected by a stroke through it, the right letter written in the margin, and a vertical stroke after this letter A caret is used where something is to be inserted; a mark like a d where something is to be deleted or omitted. Proof-reading must be done with attention to the form rather than the meaning, except where the editor or author may wish to make alterations in the meaning rather than to correct the form. It is difficult and unsafe to attempt to combine both purposes in a single reading. In general, even the form requires three readings, preferably by at least two different persons.

Prop'aga'tion, as a natural process among wild plants, is accomplished by the various methods of scattering spores (*q. v.*) and seeds (see SEED-DISPERSAL), through parts of plants, as buds and twigs, breaking off and taking root or even by the entire plant being carried by the wind, as such "tumble-weeds" as the Russian thistle and pigweed. Other means of propagation are runners and branches that take root at their joints or tips, as the strawberry and raspberry. Many plants spread only too effectively through shoots sent up by their roots and underground stems, as the silver-leaf poplar and Canadian thistle. But in the horticultural sense propagation refers to a group of artificial processes, as budding, grafting and layering (see these headings), the planting of seeds, bulbs, tubers, cuttings etc. or the transplanting of young plants (see HOT-BED). The reproduction of plants by other means than from the seed is spoken of as vegetative propagation, and is used to keep some desirable characteristic that will not breed "true" in seedlings, as in fruit-trees. (See GRAFTING.) For the manner in which new varieties are produced see PLANT-BREEDING.

Prosenchyma (*prŏs-ĕn'kĭ-mȧ*) (in plants), a tissue in plants whose cells are elongated or fibrous. It is a general name covering all elongated and fiber-like cells, as distinct from parenchyma, which is a tissue composed of cells whose three diameters are approximately the same.

Proserpina (*prō-sĕr'pĭ-nȧ*), daughter of Zeus and Demeter. While gathering flowers on the plains of Sicily, she was abducted by Pluto and taken to his abode in the underworld, where she was found by her mother after a nine-years' search, and given up by Pluto only on condition that she live underground for part of the year. The myth clearly is an expression of the revival of nature every year, after winter is over.

Protagoras (*prō-tăg'ō-rȧs*), the earliest of the Greek sophists, was a native of Abdera, born about 481 B. C. The basis of his philosophy is the proposition that "man is the measure of all things." All his works are lost, and he himself perished at sea (*c.* 411) while on his way to Sicily to escape a charge of atheism brought against him at Athens.

Protandry (*prō-tăn'drĭ*), (in plants), a condition in which the stamens are mature and shedding pollen before the stigma of the same flower is ready to receive it. See POLLINATION.

Protec'tion is the aid given by government to particular industries by bounties by taxation of other industries or, more commonly, by tariff or import-duties on foreign products. See POLITICAL ECONOMY.

Protec'tor, a title which has sometimes been conferred on the regent or governor of the kingdom during the minority of the sovereign. Oliver Cromwell in 1653 took the title of lord-protector of the commonwealth of England, Scotland and Ireland, and ruled under that title until his death.

Pro'teids, a large group of organic compounds found in animals and plants. They form the chief constituents of blood, muscle, nerves, glands and other organs of animals, and play an important part in plant-life. Although much work has been done in attempting to learn their exact chemical constitution, little definite is yet known. They are amorphous, and contain about 54 parts carbon, 7 hydrogen, 16 nitrogen, 21 oxygen and from 1 to 1½ sulphur. They differ widely in solubility and in their decomposition-products. Food-stuffs have been divided into two divisions: heat-producing and tissue-forming, the amyloids and fats constituting the former and proteids the latter division. This, however, is very misleading if it implies that the oxidation of proteids does not develop heat and that amyloids and fats subserve only the production of heat. Proteids are tissue-formers, but they also are heat-producers because they are competent by chemical metamorphosis in the body to give rise to amyloids. The following is one of the several classifications that have been made of proteids:

I. Albumens, soluble in water: 1. Serum; albumen; 2. Egg albumen.

II. Globulins, insoluble in water, soluble in very dilute acids and alkalies, soluble in dilute solutions of sodic chloride and other neutral salts: 1. Myosin; 2. Globulin; 3. Fibrinogen; 4. Vitellin.

III. Derived albumens, insoluble in water and solutions of sodic chloride, soluble in dilute acids and alkalies; 1. Acid albumen; 2. Alkali albumen or albuminate casein.

IV. Fibrin, insoluble in water, sparingly soluble in dilute acids and alkalies and in neutral saline solutions.

V. Coagulated albuminoids,

VI. Amyloid substance or lardacein.

VII. Peptones, produced by action of the gastric juice on all albuminoids.

Prot'estantism, a term derived from the *protest* of Luther and his adherents against the decree passed by the Roman Catholic states at the second Diet of Speier, in 1529. The principles involved in this protest were that the Roman church has no authority over the Reformed church, that the authority of the Bible is supreme and above that of bishops and councils and that it is to be interpreted, not according to tradition, but by its own language. The right of private judgment in reference to the interpretation of the Scriptures is the principle of Protestantism that especially distinguishes it from Roman Catholicism. Protestant churches are divided into numerous branches, with wide differences of doctrine and forms of worship, but all agree in the assertion of independence from the Roman see.

Proteus (*prō'tē-ŭs* or *prō'tūs*), in the oldest Greek mythology, appears as an old man of the sea who tends the seal-flocks of Neptune, his father and is endued with the gift of prophecy. His favorite residence, according to Homer, is the island of Pharos, near the mouth of the Nile. Here he rises at midday from the floods, and sleeps in the shadow of the rocky shores, surrounded by the monsters of the deep. But when caught by persons who sought to have him foretell future events, he would try to escape by assuming all manner of ugly shapes and disguises, and would refuse to exercise his gift until he found that further resistance would be useless.

Prothallium (*prō-thăl'lĭ-ŭm*), among plants, is a name applied in a general way to the gametophytes of *Pteridophytes* and *Spermatophytes*. It specially belongs, however, to the ferns, in which the prothallium, often written prothallus, is a quite distinct but very small green and notched thallus. Upon the under side of this small body the antheridia and archegonia occur. From the fertilized egg within the archegonium the ordinary leafy fern-plant arises. When in other plant-groups the prothallium ceases to be independent, as in seed-plants, it often retains the name. For example, many would speak of the female gametophyte (endosperm) found in seeds as a female prothallium. See GAMETOPHYTE.

Proth'ero, George Walter, English historian, was born in Wiltshire, Oct. 14, 1848, and educated at Eton, Cambridge and the University of Bonn. From 1876 to 1894 he was tutor and university lecturer at Cambridge, after which, for five years, he was professor of history at Edinburgh University. In 1899 he succeeded his brother as editor of *The London Quarterly Review*. His published work embraces *The Life of Simon de Monfort; Memoir of Henry Bradshaw;* and *The British History Reader*. Rowland Edmund Prothero, besides editing *The Quarterly*, has published *The Life of Dean Stanley*, besides editing the latter's *Letters, Letters of Edward Gibbon, Letters of Byron* and *Letters of Richard Ford*. He has also written a *Life of Queen Victoria*, a memoir of *Prince Henry of Battenburg, The Psalms in Human Life* and *Pioneers of English Farming*.

Protococcus (*prō'tō-kŏk'kŭs*), a genus of plants which are among the simplest of the green algæ. The mature plants are single, spherical, green cells, which occur in masses. See CHLOROPHYCEÆ.

Protogyny (*prō-tŏj'ĭ'nĭ*) (in plants), a condition in which the stigma is ready to receive before the pollen of the same flower is ready for shedding. See POLLINATION.

Protonema (*prō'tō-nē'ma*) (in plants). When the asexual spores of mosses germinate, they at first produce green, branching filaments, which are prostrate and resemble ordinary green algæ. Upon this filamentous body the ordinary leafy branches arise. This algæ-like body is known as the protonema. See MUSCI.

Protoplasm (*prō'tō-plaz'm*), the living substance in animals and plants. Huxley called it the "physical basis of life." It is the only substance endowed with life. It is very similar in animals and plants, and within it all living activities take place. It is a jelly-like, colorless substance, appearing finely granular under the microscope. It is composed of two parts: one more solid, which stains deeply with dyes (*chromatin*), and a fluid part (*achromatin*), which stains very faintly or not at all. The discovery of protoplasm and the gradual appreciation of the part it plays in the living world were among the greatest scientific advancements of the nineteenth century. In 1835 Dujardin, a French naturalist, was studying the simplest animals (*Protozoa*) under the microscope. He observed that their bodies were composed of a sort of transparent jelly, that moved and contracted and showed evidences of being alive. This soft, jelly-like substance he called *Sarcode*, and described it as living matter endowed with life. In 1846 Hugo von Mohl, a botanist, called attention to the viscid contents of plant-cells, for which he proposed the name *protoplasm*. This name had been used in 1840 by Purkinje for animal substance, but Von Mohl first brought it into general use. Presently naturalists began to suspect that the *sarcode* of the zoologists and the *protoplasm* of the botanists are essentially identical in nature. This was definitely maintained by Cohn in 1850. In 1860 Max Schultze placed the matter on a secure basis, and applied the term protoplasm to all living substance, either animal or vegetable. This led to what is known as the protoplasm-theory, which absorbed the cell-theory of Schleiden and Schwann. By Max Schultze the cell was defined as a mass of protoplasm surrounding a nucleus. Although protoplasm is so similar in appearance and reactions in all living beings, nevertheless, there must be unperceived differences — possibly not of kind but of degree of modification. See CELL-DOCTRINE.

Protozoa (*prō'tō-zō'a*), the simplest animals. Collectively, they form the subkingdom of protozoa. They are microscopic and unicellular, and abound in stagnant water. They are of great interest to zoologists and physiologists, because in them the processes of life are reduced to their simplest expression. By studying them many facts are obtained that help in understanding the more complex animals. They have recently been studied in reference to their reactions to stimuli, and many important results obtained. The daily life of a protozoön was made the subject of study in one of our laboratories of physiology. The group includes simple forms like the amœba and its relatives, having root-like feet and constituting the class of *Rhizopoda*. Many of the rhizopods have no covering, but others either secrete a shell or gather hard particles and build one. Chalk is largely made of minute, limy shells of protozoa. The form most common in chalk is a cluster of globular chambers, varying in size. The walls of these shells are perforated by minute holes, through which the soft protoplasm of the animal protrudes. They constitute an order called foraminifera or hole-borers. These animals are abundant in warm and temperate seas. They live near the surface and, as they die, their shells sink and reach the bottom. Deep-sea explorations have brought from great depths a soft ooze, formed almost entirely of these shells of foraminifera. Somewhat similar forms make shells of great beauty, of quartz or silica, which cannot be dissolved by acid or melted by fire. They constitute the order of *Radiolaria*. The higher protozoa belong mainly to the class of *Infusoria* (which see). These minute animals have hair-like processes (*cilia*), which propel the body through the water like the action of many small oars. In some forms the hair-like threads are large, reduced in number to one or two and called flagella. Thus the class of infusoria is separated into the two divisions of the *Flagellata* and the *Ciliata*. The latter contains the highest developed of the protozoa. Among the more common forms may be noted the slipper-animalcule (*Paramœcium*), with a free-swimming, slipper-shaped body; the bell-animalcule (*Vorticella*), with a bell-shaped body anchored by a stalk; and the trumpet-animalcule or stentor. The rhizopoda and the infusoria are the chief classes; two others of less importance are recognized. See Leidy's *Freshwater Rhizopods of North America*, beautifully illustrated, published by the United States government; and Kent's *Manual of the Infusoria*.

Provençal (*prō'vŏn'sal'*) **Language, The,** is one of the so-called Romanic languages, all of which are descended from the language of ancient Rome. Wherever Romans

law, custom and trade established themselves, the language followed. In this way the inhabitants of northern Italy, Spain, France (Gaul) and parts of Switzerland received a new tongue. The language which came into common use in these places, however, was the low Latin of the provinces, a colloquial form of Latin, lacking much of its grammatical precision. This low Latin, mingling with the languages or dialects of various places, produced, in time, a number of new languages having the same background but little else in common. Writers distinguish six such Romanic languages: Italian, Moldavian, Spanish, Portuguese, French and Provençal, the latter a dialectic language of the south of France, whose use extended from Lake Geneva to the Bay of Biscay and to the Mediterranean. This section of France had not only a language of its own but a literature, which in the 12th and 13th centuries was especially rich in poetry. It was in this language the songs of the troubadours were mostly composed, so that Provençal and troubadour are often used as synonymous terms. The conquest of southern France by northern France in the 13th century, reduced the old Provençal tongue to the level of a mere dialect; nevertheless, its effect upon the language which has superseded it is marked, and the relation of the two affords a battleground for modern philologists. In the poems of Mistral, however, Provençal still is a living language.

Prov'erbs are very hard to define; but nearly everybody knows one when he sees or hears it. Perhaps the best description is that of Cipriano de Valera: "Proverbs are short sayings, sententious and true, and long since accepted as such by common consent." The distinctive characteristic of the proverb is that it is a popular current saying, adopted as a convenience by the community. It must indeed have shortness, sense, salt, pith and other qualities, but it also is necessary that these should be so combined that it will strike the popular fancy and thereby come into general use. It has been well-said that no one man ever made a proverb. It has equally well been said that "the proverb is the wisdom of many and the wit of one." He may have made an original saying, but the proverb is a creature of popular suffrage. Not only is this the case, but they pass from one nation to another and become the property of the race; and for this reason it is impossible to determine even the nationality of some of our best and most popular proverbs. The office of the proverb is to "hit the nail on the head," to "put the matter in a nutshell," to speak the last word, to settle the issue without further argument or discussion. Of all national groups of proverbs the Spanish contains the greatest number, 25,000 or 30,000; and they are as racy as numerous. Among oriental proverbs the Arabic ones hold the first place in quantity and perhaps also in quality, but the Persian and Hindustani proverbs also are excellent, and in the Turkish there sometimes is a vein of poetry that is very striking. It is a question whether the tender beauty of our proverb: "God tempers the wind to the shorn lamb" is not rivaled by its Turkish parallel: "God makes a nest for the blind bird."

Prov'idence, R. I., a seaport and capital of Rhode Island. It is the second city of New England in wealth and population, and is an important center for manufacturing and shipping and for its railroad and financial interests. It is celebrated for its manufacture of jewelry and silverware. It also produces tools, stoves, engines, locomotives, cottons, woolens, corset-laces, shoe-laces, lampwicks etc., and has many bleaching-works. It is situated at the head of navigation on an arm of Narragansett Bay (called Providence River), 35 miles from the Atlantic and 44 from Boston. Among the many notable public buildings and institutions are a city-hall of granite, costing $1,000,000, with the state soldiers' monument facing it; the state-house, custom-house and postoffice; the Athenæum; the buildings of the Rhode Island Historical Society; the Arcade and Butler Exchange; a great number of churches, schools, libraries, hospitals and asylums, including a noble charity known as Dexter Asylum for the poor; the Quaker College; and Brown University (*q. v.*). Providence was settled in 1636 by Roger Williams. Population 224,326.

Prunes are the dried fruit of a certain variety of plum-trees, largely prepared in France and exported from that country. Considerable quantities also come from Bosnia, Servia and California.

Prun'ing, the removal of branches from trees and shrubs to add to their health, increase their production of fruit or render them more ornamental. Forest-trees are sometimes pruned to increase the size of the trunk for timber purposes. In pruning it is necessary to understand the particular nature of the tree or shrub to be pruned, but it may be laid down as a general rule that the branches cut off should be small in proportion to the size of the trunk. The proper season must be known, pruning for some trees can be done only in the resting season, of others in the time of full growth The cut should be smooth, care being taken that the wound shall heal rapidly. Large cuts must be covered with a preservative.

Prussia (*prŭsh'-ȧ*), the largest and most important state in the German Empire, is bounded on the north by the German Ocean, Jutland and the Baltic; on the east by Russia; on the south by Austria, Saxony, the Thuringian states, Bavaria, Hesse-Darm-

stadt and Alsace-Lorraine: and on the west by Luxemburg, Belgium and the Netherlands. The total area is 135,134 square miles, with a population of 40,163,333; that is, nearly two thirds of the German Empire in territory with about three fifths of the population The frontier has a circumference of 4,720 miles. About one fifth of the present area has been acquired since 1853, the largest gains being made after the victorious war of 1866. The greater part of Prussia belongs to the northern plain of Europe, while less than a third, chiefly in the southwest, can be described as hilly or mountainous. The northern plain is watered by five large rivers — the Niemen, Vistula, Oder, Elbe and Weser — all of which rise beyond the borders of the kingdom, and also by the Pregel, Eider and Ems, which are wholly Prussian. In the west the chief river is the Rhine, which enters Prussia at Mainz (Mayence), and thence flows north through a narrow valley; it is navigable throughout its entire course in Prussia. The capital of Prussia and also of the German Empire is Berlin (population 2,070,695) The other chief towns of Prussia are Breslau (511 891), Cologne or Köln (516,167) Frankfort-on-the-Main (414,598), Hannover (302,384) and Magdeburg (279,685)

Education is compulsory between six and 14, its management and direction being under the control of the state. Prussia has ten universities, Königsberg, Berlin, Greifswald, Breslau, Halle, Göttingen, Münster, Bonn. Kiel and Marburg, which number 1,698 professors and 20,785 students. In addition to the libraries of the universities, there is the Royal Library at Berlin, with 800,000 volumes and 15,000 manuscripts. Among the numerous scientific and literary schools and societies are the Academy of Arts, the Royal Museum of Arts, the Academy of Sciences and others

In 1910 the strength of the German army on a peace footing was 622,480, of whom 70,980 were cavalry and 91,241 field and foot artillery. The peace strength to-day of the Prussian army of all arms and ranks is about 475,000 men. Every able-bodied Prussian between 20 and 39 is liable to be called on to serve, clergymen of the Roman Catholic and Evangelical churches and indispensable supporters of families being exempt. For the history of Prussia, especially since her successful wars with Austria in 1866 and with France in 1870, at which date King William I became emperor, see GERMANY. The present king of Prussia, who also is German emperor, is William II, who came to the throne on June 15, 1888. See GERMAN EMPIRE.

Pruth, an affluent of the Danube, rises in Austrian Galicia on the northeastern side of the Carpathian Mountains, and flows eastward past Kolomea and Czernowitz. Length about 720 miles.

Pseudonym (*sū'dŏ-nĭm* (Greek *pseudos*, false, and *onoma*, name), a false or assumed name adopted by an author, which conceals his identity. In recent times young authors especially have frequently risked the publication of their first work under a pseudonym — otherwise called *nom de plume* or pen-name — and have kept it up afterwards, and this to such an extent that the real name of the author in some cases is almost unknown to the general public. For instance, the name of *George Eliot* is familiar to book-readers on both sides of the Atlantic; but few would recognize a work by Marian Evans, her maiden name. Among the famous pseudonyms of the 19th century we may mention *Currer Bell*, Charlotte Brontë; *Hosea Biglow*, James R. Lowell; *Bystander*, Goldwin Smith; *Boz*, Charles Dickens; *Pisistratus Caxton*, 1st Lord Lytton; *Grace Greenwood*, Mrs. Lippincott; *H. H.*, Helen Hunt Jackson; *Gail Hamilton*, Mary Abigail Dodge *Marion Harland*, Mrs. M. V. Terhune; *Orpheus C. Ker*, R. H. Newell *Owen Meredith*, Earl of Lytton; *Petroleum V Nasby*, D. R. Locke; *Ouida*, Louise de la Ramée; *George Sand*, Madame Dudevant; *Timothy Titcomb*, J. G. Holland; *Mark Twain*, Samuel L. Clemens; *Josh Billings*, Henry W. Shaw, *Uncle Remus* Joel Chandler Harris; *Artemus Ward*, Charles F. Brown.

Psyche (*sī'kĕ*). According to Grecian mythology, Psyche was the youngest daughter of a king and so lovely that she aroused the jealousy of Venus, who sent Cupid to the maiden to inspire her with love for the basest of men; but Cupid himself was so impressed with her charms that he at once loved her, and desired to make her his own. As she reciprocated his passion he visited her every night, earnestly requesting her not to inquire or seek to know who he was. But her jealous sisters, working upon her fears and her inquisitiveness as well, represented to her that she was embracing a monster in the darkness of the night. To satisfy herself she lighted a lamp while Cupid was asleep, when to her great delight she saw that her lover was the handsomest of gods. In her excitement, however, she let a drop of hot oil fall on his shoulder, when he arose, and after upbraiding her for her doubts forsook her. After wandering about for some time, she came to the palace of Venus, when she was seized by the goddess and kept as a slave. Cupid, however, still loved her, and after a time was united to her in immortal wedlock. The story is considered by all critics to be a beautiful representation of the progress of the soul through earthly passion and misfortune to eternal peace and joy.

Psychology (*sī-kŏl'ŏ-jy*) (Greek *psychos*, soul, and *logos*, discourse), the science of

mind or, in more general terms, of man's immaterial nature. The dividing line between mind and matter cannot be definitely drawn, because neither can be accurately defined; but our reason plainly teaches that there is a fundamental difference, notwithstanding the intimate relation each sustains to the other. To escape the difficulty of distinguishing properly between mind and matter, one school of extremists, whose chief apostle was famous Bishop Berkeley, maintains that mind is the only reality in the universe and that all external or visible objects at most are but expressions or manifestations of mental states. Another school, much more numerous, regard all mental acts and states as mere qualities of matter or, at most, as mere results of the *force* with which matter has been endowed. Thought, feeling, volition, this school tel's us, are the product or output of man's brain and physical organization, as a flame of heat is the output of a fire or as rays of light are the output of the sun, under all the physical conditions to which it is subject. It ought to be a sufficient answer to both these schools, that we are conscious of living both in a material realm and in one that is not material; we know that there is an external world, and we also know — to use the language of Scripture — that there is a spirit in man; we know that we have bodies made of flesh and bone and blood, and we alsc know that we have a *being* that is not flesh or bone or blood; we know that we have "senses, affections, passions;" and we knov , too, that we have qualities within us that unite us to the unseen and the eternal. "I am a spirit inhabiting a body."

The division of the mental faculties which is now generally accepted is threefold; the intellect; the sensibilities or emotions; and the will. Under each of these are numerous subdivisions. Of late years the science of psychology or mental philosophy has received a large measure of attention; not only in schools and colleges, but from the general public; and we can only refer the reader to the various essays and textbooks — their name is legion — that have been written and published on the subject. See *Elementary Psychology* by Sorley and Höffding's *Outlines of Psychology*.

Psychology for Teachers. The great movement for the professional training of teachers in the latter part of the 19th century was based on the idea that back of education lies a method that can be understood only by those who are versed in psychology. Educational reformers have for nearly three centuries been placing some emphasis on this idea, but only recently can it be said to have become a moving force with a large number of the ank and file among the teachers. During the last 20 years, however, the belief came to be very generally entertained that psychology, especially physiological and experimental psychology and child-study would revolutionize education. The new education based on these was, in contrast with the old education, to be authoritative and scientific. Perhaps the most notable advocate of this view is President G. Stanley Hall. On the other hand, many psychologists, especially Professors James and Münsterberg, maintain that these hopes are extravagant and that the new psychology, based on physiology and experiment, so far from being likely to revolutionize education, has even less to offer for the guidance of the teacher than the old psychology. Moreover, they regard a knowledge of the old psychology, as, although possibly helpful, by no means indispensable.

In the development of psychology the original movement toward the utilization of mathematics, experiment and scientific methods generally is due to Herbart. To him the most important application of psychology was to education. He founded the positive part of his educational practice on a psychology that did not differ n method essentially from the old except in an untenable employment of mathematics. To careful observation he looked for the discovery of individual differences and abnormalities that hinder the success of that method of teaching which for the average student is psychologically sound.

It must be confessed that physiological and experimental psychology and even child-stucy have so far not given to education much that is of such specific application as to make it a science like engineering. In a general way, however, the new psychology and, especially, its spirit of scientific criticism and method have modified and are modifying the attitude and method of teachers in a way that promises to be revolutionary. Moreover, we are learning what we may hope for from psychology. That the study of children will reveal what to teach we have come to doubt. The end of education is no longer thought to be merely general mental discipline or "harmonious development of all the powers." It has come to be conceived as efficiency or adjustment to the conditions of life. Though psychology can reveal the powers of the mind and the laws of their development, it can not show the social and industrial conditions with which these powers should be prepared to deal. But when once we have settled what should be taught, we may look to the psychologist to tell us the proper order and method of presenting it.

Among the most important effects of general psychology upon education may be mentioned the inductive method, involving the method of development (compare TEACHING, METHOD OF) and the recognition of the importance of interest (*q. v.*) in

schoolroom work. With this may be coupled the use of the analytic rather than the synthetic method in many subjects. The most important example of this is the word-method in teaching reading, according to which the child learns first to recognize the written or printed word and later analyzes it into letters. This is after the analogy of the learning of spoken language, where we begin with words rather than with phonic elements. The sentence-method goes one step further in beginning with whole sentences, later analyzing them into words and letters. So, too, in learning a language the analytic method endeavors to get the learner to use the language immediately and later to analyze out its grammatical principles and forms. All these are founded on the discovery that the child begins with a complex experience and later analyzes it. (See CHILD-STUDY.)

Psychology has led to a better comprehension of the laws of memorizing (*q. v.*) and of habit. It has emphasized the fact that learning is always through and for the sake of doing. Indeed, in the investigation of the motor-powers psychology has been especially helpful. The development of control over the body has been carefully studied. The sequence of random, spontaneous acts, experimental efforts, followed by the gradual elimination of such as are undesirable and the fixation of the rest as habitual responses to certain stimuli has been shown to be the regular sequence in developing skill of any sort. The general principle that larger fundamental muscles are brought under control before the smaller accessory ones and that, therefore, the muscles of the arm should be practiced before those of the fingers has been made clear. The importance of imitation, especially in the development of self-consciousness and the social and moral sense, has been traced out, and the effect of suggestion analyzed. The training of the mental powers has been shown to consist in storing the memory with useful material and the practice in its use, together with the formation of such habits as make for efficient thinking. Thus the conception of formal discipline has been discredited. (See MENTAL DISCIPLINE.)

Physiological psychology has done a little toward determining the laws of fatigue. More careful observation and experiment have shown the existence of wide individual differences among children and the consequent danger that class-teaching may fail to reach many. The importance of testing children for power and kind of memory, motor-ability, hearing and sight, capacity to attend, etc., has been shown. It has become evident that schools need the supervision both of medical and of psychological experts, that the unhealthy and the abnormal may be singled out for special treatment.

Finally, child-study has done much to determine the nature and order of development of the instincts to which teachers must appeal and the general history of physical and mental growth from infancy to manhood. See ADOLESCENCE, APPERCEPTION, ASSOCIATION OF IDEAS, CHILD-STUDY, FEELING, INTEREST, MEMORIZING, MENTAL DISCIPLINE, TEACHING, METHOD OF, and MODERN EDUCATION. Consult *Talks to Teachers on Psychology* by James; *Principles of Teaching* by Thorndike; *Fundamentals of Child-Study* by Kirkpatrick; and *The Educative Process* by Bagley.

Pteridophytes (*tĕr'ĭ-dŏf-ĭts*), one of the four great groups of plants, which includes the ferns, the scouring rushes or horsetails and club-mosses. The ferns are the most abundant and representative forms, containing about 4,000 species; the club-mosses are represented by a little over 400 species; but the horsetails only by 25 living species. The group as a whole is characterized by having a leafy and vascular sporophyte, in this way decidedly differing from the bryophytes (mosses) and resembling the spermatophytes (seed-plants). From the seed-plants the group differs in that its members do not produce seeds. The group as a whole is most extensively developed in the tropics, where especially the ferns and "little club-mosses" (*Selaginella*) are luxuriant both in forms and numbers. The three great divisions of pteridophytes differ exceedingly from one another in external appearance, but all are held together by important similarities. One of their important characteristics in common is the possession of a large, coiled and multiciliate sperm, very distinct from the simple, biciliate sperm of the bryophytes. See EQUISETALES, FILICALES and LYCOPODIALES.

Ptolemy (*tŏl'ĕ-mĭ*), **Clau'dius Ptolemæ'us,** an eminent mathematician and astronomer. He was born probably either in 70 or 77 A. D., and died at Alexandria in 147 A. D. As a mathematician he is especially to be remembered as having written the first treatise on trigonometry, a branch of mathematics invented by Hipparchus. In astronomy he wrote a complete treatment upon the entire subject as known in his time. This volume, *The Almagest*, remained a standard work until the time of Copernicus. Ptolemy assumed that the earth is spherical, is placed in the center of the spherical heavens and is a mere point compared with the distances of the fixed stars. As a geographer, Ptolemy was the first to point out the fact that the position of any point on the earth's surface can be accurately stated only after its longitude and latitude have been determined. In addition to these works he wrote a volume on optics, in which he stated the correct laws of reflection for plane surfaces and for concave mirrors as well as the law of refraction. Ptolemy must be

considered as one of the earliest types of the modern scientific investigator.

Pub'lic Schools. See SCHOOLS.

Puck or **Rob'in Good'fellow,** a familiar figure in the fairy world of English folklore, immortalized by Shakespeare in *Midsummer Night's Dream.* The name really is a generic term for a fairy. Although the Pucks are noted for mischievous tricks, they sometimes perform kindly, domestic functions; are small and dwarf-like in appearance; and are easily propitiated by offerings of cream and kindly epithets. The name *Puck* was adopted by an illustrated weekly published in New York.

Puebla (*pwā'blä*), the second city of Mexico, stands on a fruitful plain, 7,000 feet above the sea and about 100 miles by rail from the City of Mexico. It was founded in 1531, and is one of the handsomest cities in Mexico. During the French occupation of Mexico (1862–3) it was besieged by Maximilian's troops for two months, and taken by storm on May 17, 1863. Population 93,521. Puebla also is one of the inland states of Mexico, area 12,204 square miles, with a population of 1,021,133.

Pueblo (*pwĕb'lō*), **Col.,** county seat of Pueblo County, has an altitude of 4,685 feet and an ideal climate. It is on the eastern slope of the Green Horn Range of the Rocky Mountains, in the famous Arkansas Valley, which comprises one of the largest single irrigated areas in the world, extending 250 miles from Royal Gorge to the Colorado-Kansas line. The city has the largest steel and iron producing plant west of the Mississippi River, gold, silver and zinc smelters, and factories producing candy, tents, brick, tile, fencing, saddlery, leather goods, canned products, extracts and baking powder. Pueblo has a commission form of government both for the city and the county. It is the record city in the state in size. Population, 51,218.

Pueblos (*pwĕb'lōs*) (Spanish *pueblo,* village), a semicivilized family of Indians in New Mexico and Arizona, dwelling in single habitations, which sometimes are large enough to contain a whole tribe. These buildings, which sometimes are five or six stories high and from 100 to 500 yards in length, are generally made of sun-dried brick; the ground-floor is always without doors or windows, entrance being effected by a ladder to the second story. Each family has a separate apartment, and there also are large rooms for general council chambers and for tribal dances. Under Roman Catholic missionaries the Pueblos are making steady progress in education and civilization, although they have grafted upon their Christianity many of their old pagan beliefs and customs, to which they cling. The cliff-dwellers doubtless were the ancestors of the Pueblos, ruins of their dwellings being seen in the cañons of the Rio Mancos, Rio Plata and San Juan Rivers in southwestern Colorado, New Mexico and Arizona. In these cliffs the strata of sandstone or limestone were separated by layers of soft clay which had worn away, leaving ledges of rock with caverns between. Upon these terraces are remains of clusters of dwellings, one ledge forming the floor and another the roof, the opening being faced so skillfully as to resemble the rock of the cliff. Some of these dwellings are now inaccessible. The marks of dangerous, doubling paths, hardly a foot wide, formerly used, can be seen on the cañon walls. San Juan cañon is shut in by walls of rock several thousand feet high, and one settlement is 1,000 feet above the Rio Mancos. Cliff villages or towns are found in the bottom-lands, with round stone towers near them, evidently used as watch towers.

Puer'to Rico. See PORTO RICO.

Puff'balls', fleshy fungi related to the mushrooms, but in which the spores fully develop without being exposed. See BASIDIOMYCETES.

Puget (*pū'jĕt*) **Sound,** a large inland sea northwest of the state of Washington, communicating with the Pacific by Admiralty Inlet and the Strait of Juan de Fuca. It penetrates far into the interior, and is everywhere navigable for the largest vessels, which, in most cases, can ride close to the shores and load and unload without wharves. Great quantities of pine and fir are shipped from the region, which is rich in timber. Seattle and Tacoma are the chief towns on the sound. See SEATTLE, TACOMA and WASHINGTON (State).

Pulas'ki, Cas'imir, a Polish count and general who fell in the American Revolutionary war, was born in Podolia, March 4, 1748. On account of the active part he took in the Polish war against Russia he was stripped of his estates and outlawed in the partition of Poland in 1772. In 1777 he offered his services to the American colonies in their contest against England, and for his gallant conduct at the battle of Brandywine was given a brigade of cavalry, which he commanded until March, 1778. In May, 1779, he entered Charleston at the head of Pulaski's Legion, a corps of lancers and light infantry which he had organized, and held it until the place was relieved; he afterward followed and harassed the British until they left South Carolina. At the siege of Savannah (1779), on the 9th of October, he fell in an assault at the head of the cavalry and died two days later.

Pul'ley, one of the mechanical powers much used in lifting stone and heavy timber. It consists of a wheel with a groove around its circumference, which revolves on an axis. The wheel, which is commonly called the *sheave,* is placed in a mortised block of wood, which is pierced by the axle of the sheave. The cord which passes over

the sheave is called the *tackle*. The *fixed pulley* (Fig. 1) gives no mechanical advantage; it merely changes the direction in

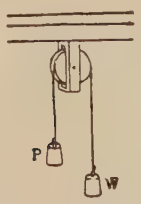


FIG. 1

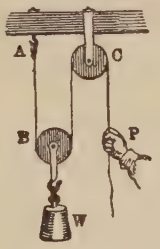


FIG. 2

which the force is applied; thus W can be raised by merely pulling P down. The *single movable pulley* gives a mechanical advantage equal to two (Fig. 2); for, as the weight W

FIG. 3

FIG. 4

FIG. 5

is supported by two strings, the strain on each string is half of W; since, the strain on one being supported by the hook A, the power P has to support only the stress of the other string which passes around C. A still greater mechanical advantage is secured by a combination of pulleys, as shown in the second illustration. Theoretically, the larger the number of movable pulleys in any one combination, the greater is the mechanical advantage; but the enormous friction produced and the lack of perfect flexibility in ropes prevent any great increase in the number of pulleys. See BLOCK AND TACKLE.

Pull'man, George M., an American inventor and business man, was born at Brocton, Chautauqua County, N. Y., March 3, 1831. At 22 he engaged in moving buildings out of the way of the Erie Canal, then in process of widening. He made his home in Chicago in 1859, and in the same year he prepared models of sleeping cars, which became the foundation of his fortune. In 1863 he began building the coaches that are called by his name the world over. A few years later he organized the Pullman Palace Car Company which was to build them. In 1880 he founded Pullman, near Chicago, where the coaches were built. In 1887 he added the vestibule to his cars, which greatly increased their comfort. These carshops turn out $15,000,000 worth of railway carriages annually. He died in 1897.

Pulque (*pŭl'kā*), a favorite beverage of the Mexicans and of the inhabitants of Central America and some parts of South America, made from the fermented juice of the agave plant.

Pulsatilla (*pŭl'sa-tĭl'la*) or **Pasque Flower** is a native of many parts of Europe and of chalky pastures in several parts of England. It has bell-shaped, bluish-purple flowers. It is narcotic, acrid, and poisonous. Pulsatilla is one of the favorite medicines of the homœopathists; and Easter eggs are sometimes colored purple with the petals of the flower.

Pulse (Latin *pulsus*, a pushing or beating). The phenomenon known as pulsation is due to the distension of the arteries when blood is sent through them by the contraction of the heart. The pulse is usually examined at the radial artery at the wrist, the advantage of that position being that the artery is easily compressed against the bone. The frequency of the pulse varies with age, from 130 or 140 beats per minute in infancy to 70 or 75 in adult age. It also varies somewhat with sex, adult females having six or eight more beats per minute than males. It is increased by exertion or excitement, and is diminished by lying down or sleeping. In some diseases the pulse may reach 150 to 200 beats per minute; and, on the other hand, in certain organic affections of the heart it may be as slow as 25 or 30. The force of the beats is a measure of the vigor and efficiency of the heart's action, a strong pulse being regarded as a sign of health and vigor and a weak pulse as a sign of debility. The full significance of any changes of pulse in disease can be clearly understood only by considering them in connection with other signs and symptoms in the case.

Puma (*pū'mȧ*), a member of the cat family inhabiting the Americas from Canada to Patagonia. It goes under a variety of names in different parts of the country, as catamount, panther, American lion etc. It is about 40 inches long, without the tail, tawny in color above and soiled white below. Pumas are good climbers, but are not confined to wooded districts. They prey upon deer, antelope and other animals; near habitations they kill calves, pigs and sheep. See True's *Puma or American Lion* in the report of the United States National Museum for 1889.

Pum'ice (*pŭm'ĭs*), a light mineral, full of pores like a sponge, found near volcanoes. This highly porous and froth-like structure is due to the escape of vapors through the lava while it was in a state of fusion. It is

much used for polishing wood, ivory, metals, glass, marble etc. Great quantities are exported from the Lipari Islands to all parts of Europe.

Pump, a machine for lifting water or other liquids to higher levels. The simplest form is the common suction-pump, which is shown in Figure 1. A is the barrel; B a pipe reaching into the water to be raised; C the spout; D a fixed valve opening upward only; E a movable valve opening upward only and carried in the bucket F, which is a hollow piece of wood or metal which, by leather or other packing, is made to fit in the barrel so closely that the water cannot pass between the bucket and the barrel; and G is the piston-rod which is operated by hand, steam, wind or other power and moves the bucket up and down in the barrel. The up-stroke of the piston at first lifts air, and, as the air cannot return past the air-tight bucket, a partial vacuum is produced in B. The external pressure of the atmosphere causes the water to ascend in B. By repeated strokes of the piston the air below E becomes exhausted and the water continues to ascend until the valve D is under water; thereafter the strokes of the pump lift the water above D and force it into the spout C.

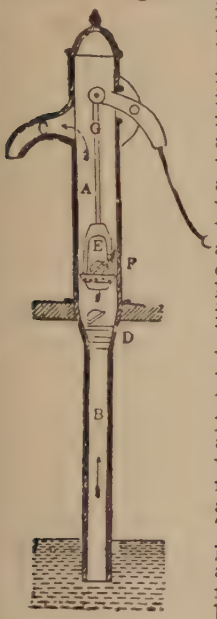


FIG. 1

The force-pump shown in Figure 2 is used to force water up into buildings. The piston is solid and the valve E, instead of being carried by the piston, is fitted in the discharge-pipe. When the piston is raised, the water rushes between the piston and the valve below and with the downward motion of the piston the water is forced past the valve E; it cannot return, and by repeated strokes the water may be forced to a considerable height. Force-pumps are used for deep wells and mines, hydraulic presses, steam and fire engines etc. There are other and more complicated forms of pumps, but all depend on the principles here explained. See AIR-PUMP.

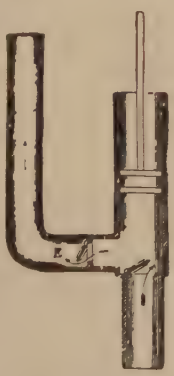


FIG. 2

Punch or the *London Charivari*, an English comic journal, is a weekly magazine of wit, humor and satire in prose and verse, copiously illustrated by sketches and caricatures. It draws its materials from the highest and lowest conditions of life, and, though stern in the exposure of sham and vice, is kindly in spirit when making merry over innocent foibles. The first number appeared in 1841, and under the joint editorship of Henry Mayhew and Mark Lemon it soon became a household word as well as an acknowledged power throughout England. It has done much to purify and elevate the standard of current wit in England. Sir F. C. Burnand, its editor for 25 years, retired in 1906.

Punch and Judy, the chief characters in a popular, comic puppet-show of Italian origin. It is generally ascribed to Silvio Tiorillo, an Italian comedian who flourished about 1600. The performance of the play requires only two persons, one to carry the theater and work the figures, the other to bear the box of puppets, blow the trumpet and sometimes keep up the dialogue with the hero of the piece.

Punc'tua'tion may be defined as the art of so dividing sentences or clauses with certain marks, as to make the sense more complete. Manutius, a Venetian printer of the 16th century, is generally regarded as the father of our present system of punctuation. Its principal marks are the period (.) generally placed at the end of a sentence and at the end of abbreviated words; the comma (,) used to separate words or pairs of words and, sometimes, clauses; the semicolon (;) used to separate clauses or divisions of a sentence requiring a more marked separation than is indicated by the comma; the colon (:) used where the sentences require a more marked separation than is indicated by the semicolon; the dash (—) sometimes performing the offices of the comma, the semicolon or the colon, but generally used to indicate a break in the thought or a change in the structure of a sentence; the interrogation point (?) used to denote a question; the exclamation point (!) used to express surprise or any special emotion; the hyphen(-) used between the divisions of a compound-word and to divide any word at the end of a line; the apostrophe (') used as a sign of the possessive case and to supply the place of any letter or letters omitted from a word; the parentheses or curves ( ) used to inclose any word or words essential to the meaning of the passage; the brackets [ ] used to include the words or remarks of the author within the writing of some other person; the quotation-marks, consisting of two inverted commas and two apostrophes (“ ”) used to inclose any word or words quoted from another person; the ellipsis (* * * * * *) or dots (. . . .), used to denote the omis-

sion of words from a quotation; the index (☞) used to point out any particular sentence or statement; the star or asterisk (*), the dagger (†), the double dagger (‡), the section (§), the parallel (‖), the paragraph (¶), which refer to notes at the bottom of the column or page or at the end of the article or chapter. There are numerous rules for the use of these various points, but perhaps no two writers or printers would agree as to the proper point to be used in all cases. Good judgment and taste and a certain amount of practice are essential to anyone who would punctuate in such a manner as to secure the fundamental object of punctuation — the expression of the sense.

To illustrate the aid that punctuation will sometimes render to an understanding of the sense of any composition, take the following example:

Every lady in the land
Has twenty nails on each hand
Five and twenty on hands and feet
This is true without deceit.

Now read the same properly punctuated:

Every lady in the land
Has twenty nails; on each hand
Five, and twenty on hands and feet;
This is true without deceit

To show how punctuation may sometimes vary the sense of any speaker or writer, the following example will serve: A member of the English house of commons called one of his fellow members a liar and was compelled publicly to apologize for the offense. He did so by rising in his place and meekly saying: "I said he was a liar, it is true; and I am sorry for it." The apology was deemed sufficient; but in the newspaper which published an account of the matter the next day, the apology was printed thus: "I said he was a liar; it is true, and I am sorry for it." See PROOF-READING.

Pu'nic Wars. This is the name commonly given to those contests which occurred between Rome and Carthage for the supremacy of the western world. The Romans called the Carthaginians *Punici*, in allusion to their Phœnician descent. The Romans never trusted their foes in the matter of their treaties, and so came to speak of Punic faith as synonymous with treachery. The wars between Rome and Carthage are under the names of these cities or are told in the biographies of the commanders engaged. The first Punic War broke out in 264 B. C.; the second in 218 B. C.; and the third in 149 B. C.

Pun'ishment. The methods by which society has dealt with those who break its regulations have in the course of history suffered radical changes. Four stages in this evolution may be noted. The earliest of these is that in which retaliation is the dominant motive. This method is illustrated by the ancient Hebrew law: "An eye for an eye and a tooth for a tooth." According to it, every injury committed by any individual was punished by inflicting a similar injury upon him, and justice required that these injuries should as nearly as possible be the same in character and amount. Psychologically this theory is founded on the instinct of revenge, and, like all instinctive acts, that of retaliation is adapted, though somewhat crudely, to an end — in this case that of terrifying the wrongdoer. Among civilized men, as among the brutes, the fear of wrath and revenge checks many an impulse to harm one's fellows. It will be noticed, however, that the instinct does not secure justice to the weak, whose revenge is not an object of dread; nor does it impose justice upon the powerful, who do not fear the anger of the weaker over whom they tyrannize. When, however, the state begins to interfere with private feuds and strengthen itself by administering equal justice to all, whether feeble or powerful, the limitations of the instinctive method of securing justice are to some extent removed. The notion that retaliation is the aim of punishment prevails long after the state has assumed the administration of justice. Eventually, however, the community comes to realize that retaliation is not the aim of public punishments, but rather the deterring of its members from committing similar offenses. Punishment does not need the broken law, nor does it compensate the injured party except when it takes the form of a fine for his benefit. It does, however, in a startling fashion reveal the probable consequences of crime, and this comes to be recognized as its true purpose. In punishment, for example, attention usually is not fixed on the welfare of the offender but, rather, on that of society. It is natural to suppose that the severer the penalty the more effective its influence in preventing crime. Blackstone cites 160 crimes that, according to the English law of his day, were punishable by death. In the latter part of the 18th century a movement for reform in the treatment of criminals began, led by John Howard (*q. v.*), the great philanthropist. As a result of this the penalties of many crimes became less severe and the treatment of those imprisoned far more humane. Society began to feel that there had been far too little charity in the treatment of criminals. The theory that punishment should be for the protection of society from the offender himself rather than to terrify prospective offenders by the spectacle of his wretched fate began to appear. Public executions, various forms of torture, the exposure of the bodies of executed malefactors, the pillory, the stocks, the whipping post — all gradually disappear. Instead, the criminal is kept imprisoned so that he will not harm others. Hard labor and confinement have replaced torture of all kinds. Care is taken

to seclude the offender from society at large. It is fairly-well demonstrated that the deterring force of exemplary punishment has been vastly overrated. Indeed the criminal is often thus brought before the people to be regarded as a hero to be imitated. His sufferings are forgotten or idealized, his courage and cleverness only are remembered. Popular feelings are brutalized or rendered morbid by sensational crimes and spectacular punishments. We know now that it is far better to accustom men to think only of right conduct than to try to frighten them out of evil.

Finally, it has come to be recognized that the highest humanity demands not merely such consideration for the criminal as is consistent with the protection of society, but that this should include an attempt to reform him. Criminals of different degrees of degeneracy are separated. They are accustomed to labor and are taught trades, since lack of industry or of skill to get a living is a common source of crime. Reformation is encouraged by credits for good conduct, by which the term of imprisonment may be shortened, or by release on probation, both of which lead to the indeterminate sentence. In summary, we may say that punishment for retaliation, though it still appears in the conduct of individuals and mobs, has ceased to be a form of public justice. Punishment for example remains, but its value is not estimated as very high. The effort of criminologists is concentrated on measures likely to insure the protection of society and especially the reform of the criminal.

In the discipline of children the same principles and the same progress are exemplified. Many parents and teachers allow themselves to punish for revenge. Although this is instinctive, nothing can be more indefensible from the point of view of justice. To prevent it one should be careful about punishing while angry, the effect of the example on others should ordinarily not be the purpose of the punishment but, rather, incidental thereto. It must be said, however, that since children can not be secluded from society like criminals, the effect of example must certainly be reckoned with. This is especially true in the school. On the other hand, it certainly is better for the order of the schools and the conduct of the child to keep his attention away from wrong-doing, when possible, and, therefore from its punishment. Further, since society is in no great danger from the young, punishment for protection does not apply very considerably to them. Reform should be the fundamental motive in this discipline. While this fact has been recognized more or less clearly from time immemorial, the punishment of the child has been insensibly affected by the general method of dealing with offenders. Its severity was intensified by the religious doctrine of original sin and the total depravity of children. The idea that "to spare the rod is to spoil the child" was current for ages during which the schoolmaster was typically represented with a bundle of switches. Corporal punishment was the method of inducing the stupid and the idle to learn and of correcting the mischievous and the rebellious. The work of the school was so uninteresting that none save the extraordinary teacher could get the child to go through with it without compulsion, and the rod was the simplest resort. The development of general interest in childhood and in education (see CHILD-STUDY) and the reforms by which the curriculum has been enriched and school-work made more interesting (see INTEREST) have caused the discipline of the child to become more humane and rational. Comenius (1592-1670) taught that punishment should be for offenses against law and order and not as an incentive to study. To Rousseau (1712-1778) we owe the theory that every penalty should be the natural consequence of the offence. If a child neglects the suggestion of the parent not to put its fingers in the fire, let it be burned. In general, according to Rousseau, the disobedient child is allowed to do as he wishes until, having come to grief many times, he learns to respect the advice or commands of his elders. Annoying children are let alone, the natural social effect of their acts. This theory has been further elaborated by Herbert Spencer. It, perhaps, furnishes the best general rule to determine the character of punishment, for the penalties are such that the child as soon as it begins to reason will see their logical necessity. It fails where the natural consequences are too serious to leave the child to learn from them, or where its conduct is so annoying to others that arbitrary punishment becomes necessary. The theory of natural consequences gives no place to corporal punishment, unless it is for physical injuries wantonly inflicted. In general it may be said that education should teach children to despise rather than fear physical pain; hence the limitation of corporal punishment. On the other hand, those who would entirely bar out this form of discipline, especially with very young or very unresponsive children, are probably extreme. To both classes it appeals as the natural penalty. See, also, MODERN EDUCATION and PRISONS. Consult Henderson's *Dependents, Defectives and Delinquents*.

Punjab (*pŭn-jāb'*) or **Panjab**, a province of India, occupying its northwestern corner, is watered by the Indus (*q. v.*) and its five great affluents — the Jhelum, Chenab, Ravi, Beas and Sutlej. The area under direct British administration (it was annexed by

that power in 1849) is 97,209 square miles; that of native states under British control, 36,226 square miles, with a population of 4,424,398. Population in the entire province 24,754,737. The whole of the northern part is traversed by spurs from the Himalayas which inclose deep valleys; but in the south the surface is broken by no elevations, except the Salt range, varying from 2,000 to 5,000 feet in height. More than half the population are Mohammedans. The Punjab is the country of the Sikhs.

Pupa (*pū'pȧ*), plural **Pupæ** (*pū'pē*), stage between larva and adult in the metamorphosis of an insect. The pupa of butterflies is often called the chrysalis or chrysalid. Some insects pass the pupa-stage in silken cocoons; some undergo change in a case made of a variety of materials; others, in a rolled-up leaf. Pupæ do not eat; some have no power of motion whatever; others merely squirm when disturbed. See METAMORPHOSIS. Consult Cragin's *Our Insect Friends*.

Pure Food Law, an interstate commerce law passed by Congress, June 30, 1906. It defined the standard of purity for articles of food and drugs, and required that the exact ingredients be printed on the label. Much has also been done along the line of inspecting and safeguarding foods by state laws.

Pu'ritans, the name first given—according to Fuller in 1564, according to Strype in 1569—to those clergymen of the church of England who refused to conform to its liturgy and discipline as arranged by Archbishop Parker and his coadjutors. During the reigns of James I and Charles I the spirit of Puritanism continued to spread in English society and in Parliament, in spite of all efforts by the government to suppress it. The tyranny of Laud and the outrages of Charles on the English constitution led many who strictly were not Puritans to oppose both church and king for the sake of the national liberties. Before the war between Charles and Parliament broke out a considerable number of the Puritans emigrated to America, where they became the founders of the New England states, and practiced the form of religion to which they were attached. See Macaulay's *Essay on Milton*, also, PILGRIMS.

Pur'ple, Tyrian. See PHŒNICIA.

Pus'ey (*pū'zĭ*), **Edward Bou'verie,** a distinguished divine of the English church, was born at Pusey in Berkshire in 1800, and graduated with high honors at Oxford in 1822. In 1827 he was appointed professor of Hebrew at Oxford, a position he held until his death. Pusey, in connection with Keble and Newman, took a very active part in the Tractarian movement; and, in 1843 was suspended from preaching for three years on account of a sermon on the Holy Eucharist. But he did not follow Newman into the Roman church, preferring to remain in the Anglican communion and exerting all his talents and learning to sustain the evangelical doctrines and standards of life that were so dear to him; and in spite of all difficulties in his way he continued his labors to this end until the close of his life. In private life Pusey was a man of warm affection, and was widely known for his gentleness, sincerity and humility. His charity was limited only by his income; besides abundant gifts to the poor, he spent large sums in helping to provide churches in East London and in founding and supporting sisterhoods. He died at Oxford, Sept. 16, 1882. Consult *Life* by Canon Liddon. See KEBLE, MANNING and NEWMAN.

Put'nam, Israel, a general of the American Revolution, was born in what now is Danvers, Mass., Jan. 7, 1718. In 1739 he bought a farm near Pomfret, Conn., and devoted himself to its cultivation and to wool-growing. During the years he was engaged in this occupation a she-wolf committed considerable ravages upon his sheep and those of the neighborhood, and all efforts to capture or kill her were in vain until Putnam entered her den in a rocky cavern with a torch in one hand and a gun in the other, and shot her before she had time to spring upon him. Putnam distinguished himself in the French and Indian War, and at the breaking out of the Revolutionary War was placed at the head of the Connecticut troops. He was active and conspicuous at Bunker Hill, soon after which he was commissioned major-general in the Continental army; and in 1777 he was appointed to the defense of the Hudson River highlands. While at Peekskill, a lieutenant in a British regiment was captured as a spy and condemned to death; and when Sir Henry Clinton sent a message under a flag of truce, threatening reprisals if the sentence should be carried out, Putnam returned the following famous answer: "Headquarters, Aug. 7, 1777. Edmund Palmer, an officer in the enemy's service, was taken as a spy lurking within our lines; he has been tried as a spy, condemned as a spy and shall be hung as a spy, and the flag is ordered to depart immediately — Israel Putnam. P. S. He has accordingly been hung." In 1778 Putnam made his famous escape from Tryon's dragoons by riding down a steep declivity at Horseneck, Conn The next year he suffered a stroke of paralysis, and the remainder of his life was spent at home. He died at Brooklyn, Conn., May 19, 1790.

Putnam, Rufus, cousin of Israel Putnam, was born at Sutton, Mass., April 9, 1738, and served against the French from 1757 to 1760. In 1778 he helped his cousin to fortify West Point, and had command of a regiment afterwards until the close of the war, being made brigadier-general in 1783. He helped to found Marietta, O., in 1788, was made a judge of the supreme court of the Northwest Territory in 1789,

and was surveyor-general of the United States from 1793 to 1803. He died at Marietta, May 4, 1824.

Put'ting the Shot consists in throwing heavy weights, and is one of the games that make up field-events in athletics. It is not so much mere throwing as pushing forward and up. The weight is called a shot, and varies from eight to twenty-four pounds. The contestant stands in a seven-foot circle, which he must not overstep, and the length of his throw is measured from the circumference to the place where the shot falls. The world-records are 38 feet, 2¾ inches with a 24-pound weight and 67 feet, 7 inches with the 8-pound shot.

THROWING THE HAMMER resembles shot-putting, and also belongs to field-events. The hammer is a 16-pound, round shot, the handle a chain four feet long with an attachment for holding. The contestant stands in a seven-foot circle, swings the hammer around himself repeatedly, and at last lets it go. The throw is measured from the circle to the spot where the hammer falls, and the record for this sport is 172 feet, 7½ inches.

Putrefac'tion is the decomposition of organic substances when accompanied by an offensive smell. It is now known to be the result of the activity of minute plants called bacteria, which also cause fermentation and many diseases. The spores of these plants are present in great numbers in the air and water and on the surface of the earth; but if we boil an infusion of organic matter, and, while the steam is coming freely off, close it in such a manner as to prevent any germs or spores from reaching the fluid, it will remain without any change for many years, but will begin to putrefy in a day or two if the plug be removed. Of the precise chemical changes that take place from the life of bacteria, we still are largely ignorant.

Puvis de Chavannes, Pierre (*pē-ār pū'vēs' dĕ shă'vănˊ*), a French painter, was born at Lyons in 1824. His teachers were Scheffer, Delacroix and Couture successively, but he was unable to yield himself to any artistic leading except his own instincts. The Salon refused his work nine times. It was only in 1861 that he first received recognition. As a wall-painter he recognized the limitations of wall-painting and submitted to the conditions. He held that fresco is merely the pleasant decoration of a surface. So he always remembered the relation of his designs to the building, and painted in flat tones of cool green, blue, brown or lilac. The pictures themselves were as much a part of the building as its walls. In America his best-known work is the decorations in the Boston library. Here he tried, he said, to symbolize its intellectual treasures. They represent the muses of inspiration hailing Apollo, and other compositions picture history, philosophy, poetry and science. Chavannes died at Paris in 1878.

Pygma'lion, in Greek mythology, grandson of Agenor, king of Cyprus, fell in love with an ivory statue of a young maiden he himself had made, and prayed to Aphrodite to give it life. His prayer being granted, he married the maiden, who bore him Paphus.

Pyle (*pīl*), **Howard,** an American artist and author, was born at Wilmington, Del., in 1853. His career began in New York City with contributions to periodicals. He chiefly delineated scenes of colonial life and medieval folk-lore. Some of the finest color-prints in recent periodicals were from his drawings. Among his works are *Adventures of Robin Hood* and *Rejected of Men.* He died Nov. 9, 1911.

Pym, John, was born at Brymore, near Bridgewater, England, in 1584. Entering Parliament in 1621, he at once attached himself to the country party, and proceeded to war against monopolies, papistry and absolutism with a force and vigor that brought him three months' imprisonment. In the impeachment of Strafford and in all other proceedings of the Long Parliament, which assembled in 1641, Pym took a leading part, his power and ability being acknowledged by the Royalists in the derisive epithet of King Pym. He was one of the five members whom Charles I attempted to arrest in the chamber of the house of commons, thus precipitating the Civil War, which resulted in the defeat and execution of the king. He died at London, Dec. 8, 1643. He was buried in Westminster Abbey, but at the Restoration of Charles II his remains were cast into a pit in St. Margaret's Churchyard. See Goldwin Smith's *Three English Statesmen.*

Pyr'amids, The, of Egypt, were the sepulchers of the kings who reigned during the first twelve dynasties. They are on the left bank of the Nile between the desert and the cultivated land scattered from Abu Rash to Meidum. Their entrances all open to the north with one exception, and their sides face directly north, south, east and west. The size of the structure depended a great deal upon the length of the builder's reign. The pyramids are constructed of large, oblong blocks of stone about two feet six inches thick, placed in layers, each layer about one block's width smaller than the one below and advancing so to the summit. They usually were covered with a coping of stone which was so completely fitted and polished as to form a perfectly smooth surface to each side.

These royal tombs number about fifty or sixty of all sizes; but the best examples are the three great pyramids of Gizeh; they were built by the kings of the fourth dynasty and are the largest in the necropolis. The first or great pyramid was erected by

King Cheops, known as Suphis or Khufu (B. C. 3733–3700), and is the largest, being 484 feet in height and its side on the base-level measuring 760 feet. It covers over 13 acres or, as commonly compared, is "more than twice the extent of St. Peter's at Rome." The second, which is 707 feet high and measures 454 feet on a base-side, was built by Chepheren (Shafra) (B. C. 3666–3633). Its measurements are exactly half those of Chepheren which seems to have been done intentionally. It now is 354 feet high and has a base-side of 218 feet. Mycerinos has a coating of red granite from Syene while limestone was employed on the other two, a little of which still remains on the summit of the second.

In each is found the sepulchral chamber where the mummy of the king was placed; then a large slab of stone weighing 50 or 60 tons was cut and fitted into the entrance. So closely do these fit that explorers are often forced to break them or bore around. In the great pyramid the king's chamber is located well-up in the heart of the structure. It has five compartments, one large or main one where the mummy rested, and four successive chambers above, one placed above the other and separated by a slab of granite leveled and polished only on the undersurface. This group of rooms is connected with the outside by means of two air-channels and a long passage which leads downward for some distance and then re-ascends at an angle of 26° to the surface, piercing about 47 feet 6 inches from above the foundations. This channel that opens on the surface extends downward, beyond the meeting with the first, into the rock below the pyramid to a chamber called the well. A third chamber is found in the heart of the pyramid, about halfway between the bottom and the king's chamber, and is connected with it. This is known as the queen's chamber. These halls or passages are lined with polished granite and limestone, and show the marvelous ability and knowledge that the Egyptians possessed in supporting so great a superincumbent weight as is above these chambers and passages. In the great pyramid a V-shaped arch discharges the weight from off the king's chamber; and the top of the passage leading to it is heightened to about 28 feet for a great length, where the downward force is greatest, and the walls resemble inverted stairways and in this form come together at the top.

In the second pyramid the chamber is partly above and partly beneath the rock-foundation, while in the Mycerinos it is entirely below. A small chapel was always built near every pyramid, but in nearly every case it has perished.

Other pyramids of importance and of great dimensions are found at various other places in the necropolis. Many of the smaller pyramids were built by people of royal blood, while the wealthy buried their dead in what are called *mastabas* and differ from the pyramidal shape, oftentimes being cut into the solid rocks.

Architects and engineers have never solved the puzzle of the pyramids, though many theories have been put forth. Some it seems have come near to the truth in a numerical plan, but the astronomical theory apparently fails. James Ferguson says: "Nothing more perfect, mechanically, has ever been erected since that time."

Consult J. Ferguson: *History of Architecture;* Perrot and Chipiez: *History of Ancient Egyptian Art;* and Mathews: *The Story of Architecture.*

Pyr'amus and This'be, two lovers whose tragical history is told by Ovid in the 4th book of his *Metamorphoses.* They were natives of Babylon, and tenderly attached; but, as their parents would not consent to their marriage, they had to content themselves with secret interviews by night. On one occasion they arranged to meet at the tomb of Ninus, where Thisbe, who was first at the trysting spot, was startled to discover a lion. She immediately ran away but dropped her robe, which the fierce animal, that had just torn an ox in pieces, covered with blood. Soon after, Pyramus, appeared and, seeing Thisbe's robe, concluded she had been murdered and killed himself. When Thisbe returned soon after, and saw her lover lying dead on the ground, she immediately put an end to her own life.

Pyr'enees, the mountain chain that divides France from Spain. It stretches from the Mediterranean to the southeastern corner of the Bay of Biscay, 270 miles, the breadth varying from 15 to 70 miles. The chain is divisible into three distinct portions — the western, the central and the eastern. Both on north and south the mountains sink down to the plains in a series of terraces with precipitous faces, the general slope on the Spanish side being somewhat steeper than that on the French side. See Taine's *Voyage aux Pyrenees.*

Pyrenoids (*pī-rē'noidz*) (in plants). In the chloroplasts of certain algæ, as in *Spirogyra,* there usually are embedded one or more colorless bodies, each one often surrounded by a jacket of starch. These bodies are reserve proteid and are known as pyrenoids.

Pyrites (*pī-rī'tēz*), a name employed by mineralogists to designate a number of minerals which are compounds of metals with sulphur or arsenic or both. They are hard and brittle, have a metallic appearance, and frequently are yellow. The kinds most usually mentioned are iron, copper and arsenical. Iron pyrites is sometimes mistaken for gold, on account of its yellow color, and therefore is called fool's gold. It is much used in the manufacture of sulphuric acid,

and sulphur is obtained from it by sublimation. It also is used for the manufacture of alum. Copper pyrites is the most abundant of all the ores of copper, and yields a large proportion of the copper used in the world. Arsenical pyrites or mispickel is of a silver-white color, and is the most common natural compound of arsenic. It sometimes is valuable on account of containing cobalt. In addition to those three kinds of pyrites are pyrrhotite or magnetic pyrites, which sometimes contains nickel, and marcasite or white-iron pyrites. Both of these consist chiefly of iron and sulphur.

Pyrometer (*pī-rŏm'ē-tēr*), in engineering an instrument for measuring temperatures so high or so low that mercurial thermometers cannot be used. All the older forms of this apparatus, depending upon the expansion of solids with rise of temperature, have entirely gone out of use. Modern pyrometers are practically all dependent either upon one or the other of two electrical principles. The first of these types is based upon the discovery of Seebeck that, when an electric circuit is made up of two different metals, a current will flow in that circuit which is proportional to the difference in temperature between the two junctions. By placing a galvanometer in the circuit this current may be measured. After the circuit has once been calibrated, that is, after the caliber of a thermometer's use has been ascertained in order to graduate it to a scale of degrees, we may infer the temperature of one junction by knowing the current and the temperature of the other junction. This form of pyrometer has been perfected principally by Le Chatelier, a Frenchman. The second type of pyrometer depends upon the fact that the electrical resistance of a platinum wire varies with its temperature. Having selected a definite piece of pure platinum wire and measured its resistance at various standard and known temperatures, we have only to place this platinum wire in the region whose temperature is desired and measure its resistance. The temperature of the region is then given by interpolation. This form of pyrometer has been perfected especially through the efforts of H. L. Callendar, the English physicist. It frequently is called a platinum thermometer.

Pyr'otech'ny. See FIRE'WORKS.

Pyrrhus (*pĭr'rŭs*), king of Epirus, was born about 318 B. C. He became sole king of Epirus in 295 B. C., and in the following year increased his territories by the addition of the western parts of Macedonia. In 280 B. C., he engaged in a war against the Romans, the first battle taking place on the banks of the Siris in Lucania. After an obstinate and bloody contest, Pyrrhus won the day by bringing forward his elephants, and thereby exciting the terror of the Romans. Pyrrhus' loss of soldiers was so great that after the fight he is said to have exclaimed: "Another such victory, and I must return to Epirus alone." Hence the phrase: A Pyrrhic victory. After continuing the war another year without any substantial results, a truce was made between the belligerents, and Pyrrhus withdrew to Tarentum. In a second war with Rome, a few years afterwards, he was utterly defeated by Curius Dentatus near Beneventum, escaping to Epirus with only a few followers; but in less than a year after this he was induced to enter on a war with the Spartans. He marched a large force into the Peloponnesus and tried to take their city, but was repulsed in all his efforts. He then proceeded against Argos, where he was killed in 272 B. C. by a tile hurled at him by a woman from the roof of a house.

Pythagoras (*pĭ-thăg'ō-rās*), a Greek philosopher and founder of a school of philosophy, was born on Samos about 582 B. C.; but his history has been so obscured by a mass of legend that it is difficult to arrive at anything certain in reference to his life. He is said to have been a disciple of Thales and other distinguished philosophers and to have undertaken extensive travels for the purpose of acquiring knowledge. In the course of these travels, which continued nearly 30 years, we are told that he visited Egypt and the more important countries of Asia. We have reason to believe that he visited Egypt, at least, and that from the priests of that country learned the doctrine of the transmigration of souls, which is one of the famous tenets of his school. He is even said to have asserted that he had a distinct recollection of having himself passed through other stages of existence. On seeing a dog beaten and hearing him howl, he bade the striker to desist, saying: "It is the soul of a friend of mine, whom I recognized by his voice." Pythagoras is said to have been the first to assume the title of *philosopher* (which means a lover of wisdom) in place of the name *sophos* (which means a wise man). We have reason for believing that he was a man of much learning, especially in mathematics. His school taught that in number alone is certainty to be found; that number is the essence of all things; that in some mysterious way numbers are things themselves. The moral teaching of the Pythagoreans was of the purest and most spiritual kind; virtue was regarded as a harmony of the soul; self-restraint, sincerity and purity of heart were especially commended; and conscientiousness and uprightness would seem to have been their chief characteristics. Of the fate of Pythagoras different accounts are given, but he is generally supposed to have died at Metapontum, Magna Græcia, 500 B. C., where his tomb was to be seen in the time of Cicero.

Pyth'ian Games, one of the four great national festivals of the Greeks, are said to have been instituted by Apollo after vanquishing Python, the snaky monster. They at first were under the management of the Delphians; but about 590 B. C. the Amphictyons were entrusted with the conduct of them, after which they were held every four years at Delphi in honor of Apollo. Some writers claim that they were not called Pythian till after this date. Originally the contests were restricted to singing and cithern-playing; but the Amphictyons added the flute, athletic contests and horse-racing. By and by contests in tragedy and other kinds of poetry, in historical recitations and in works of art were introduced and long continued a distinguishing feature of these games, which are believed to have lasted four centuries after Christ. The prize was a laurel-wreath and the symbolic palm-branch.

Python (*pī'thŏn*). See Boa.

Pyxis (*pĭks'ĭs*), a peculiar pod which opens at its apex by a circular lid, as the common twinleaf (*Jeffersonia*).

Q

Q (*kū*), the seventeenth letter, is a consonant, duplicating *k* the guttural and being a superfluous character. It is always followed by *u*, *qu* having the sound of *kw* as in *conquest* and *queen*, except in some words where *u* is silent, as in *antique* and *coquette*.

Quadrant (*kwŏd'rănt*), an astronomical instrument, invented by Hadley in 1731 for use in measuring angles at sea and in other places where a fixed divided circle is not available. The quadrant, in a crude form, had been used for several hundred years before the time of Hadley, if we admit the astrolabe graduated through 90° as a kind of quadrant. But Hadley so improved the instrument by introducing a fixed and a movable mirror and by bringing into the same line the images of the two objects whose angular distance is to be measured, that he really made a new and highly valuable apparatus. The quadrant is merely a brass frame, provided with a radial arm carrying a mirror, whose polished surface contains the axis of the quadrant. By looking through the small telescope and a half-silvered mirror (attached to the quadrant) at any particular object, one may, by rotating this radial arm, make the image of a second object appear in the same direction as the first. The angle through which the arm must be turned to secure this coincidence is half the angle subtended by the two objects; and this angle is read directly from the graduated edge of the quadrant. Sometimes only 60° of the edge is graduated, in which case the instrument is called a *sextant*. Hadley's invention immediately displaced the astrolabe and the cross-staff which had hitherto been used for taking latitudes at sea. A considerable part of the accuracy of the quadrant is due to the use of the vernier, invented by Pierre Vernier in 1631. About the same time the telescopic sight was invented by Gascoigne and the tangent screw by Helvelius. All combine to make the quadrant or sextant a thoroughly accurate instrument, now in daily use by all navigators.

Quad'rilat'eral, four fortresses of northern Italy — Mantua, Verona, Peschiera and Legnano — which form a sort of outwork to the bastion of the mountains of the Tyrol, and divide the plain north of the Po into two sections by a powerful barrier. They have figured in all the later wars fought in northern Italy, especially in the wars between Austria and the different Italian states. Russia has a similar combination in Poland, called the Polish Quadrilateral.

Quad'ruple Alli'ance, a league against Spain, formed in August, 1718, between Britain, France, Austria and Holland, to counteract the ambitious schemes of Alberoni. It was made upon the basis of the Triple Alliance, which had been formed in January, 1717, between England, Holland and France, and by which the clauses in the treaty of Utrecht having reference to the accession of the house of Hanover in England, the renunciation by the Spanish king of his claims to the French throne and the accession of the house of Orleans to the French throne, should the young king, Louis XV, die without issue, were guaranteed. The Spanish fleet was destroyed by Byng off Cape Passaro; the French crossed the Pyrenees and defeated the Spaniards several times; and at length Philip was compelled to dismiss Alberoni and accept the terms of the Quadruple Alliance.

Quæstor (*kwĕs'tŏr*) anciently was the title of a class of Roman magistrates, reaching as far back, according to all accounts, as the period of the kings. The oldest quæstors were the *quæstores parricidii* (investigators of murder, finally public accusers), who numbered two. Their office was to conduct the trial of persons accused of murder and to execute the sentence that might be pronounced. They ceased to exist as early as 366 B. C., when their duties were transferred to the *triumviri capitales*. But a far more important though later office was the *quæstores classici*, to whom was intrusted the charge of the public treasury. They seem to have gained the name of *classici* from their having been elected originally by the centuries. At first there were only two, but in 421 B. C. two more were added. Shortly after the breaking out of the First Punic War the number was increased to eight; and, as province after province was added to the Roman republic, they amounted in the time of Sulla to twenty and in the time of Cæsar to forty. At first only patricians could be quæstors; but after 421 B. C. the office was open to plebeians also.

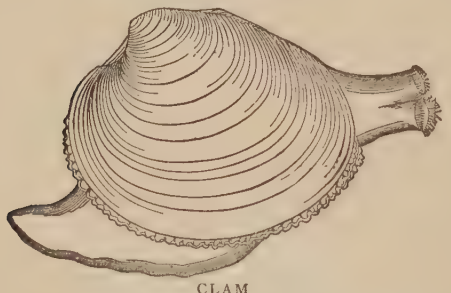
Quagga (*kwăg'gȧ*), a striped wild ass, related to the zebra and, like the latter, peculiar to Africa. It formerly abounded in herds on the plains south of Vaal River, but now is rare, if not extinct. During its abundance thousands were killed annually by Boer hunters for their skins. It is easily

distinguished from the three other members of the family, although Burchell's zebra is often erroneously called quagga. The head, neck, mane and shoulders are striped, but the stripes fade out behind the shoulders,

QUAGGA

and the hind quarters and legs are unstriped. It is of stouter build than the zebra, but has ears and tail more like a horse. Its color is reddish brown above with dark brown spots, the under surface and the legs being nearly white.

Quahaug (*qwa'hŏg*), the common round clam of the Atlantic coast found from Texas



CLAM

to Cape Cod. It is frequently seen in eastern markets and much esteemed as food.

Quail, a small game-bird of the Old World, belonging to the partridge family. There are six species. The common European quail is about seven inches long, with a very short tail. They are of a brown color, streaked with buff. They are ground-birds. They winter in Africa, and are trapped in large numbers for the market. The birds called quail in the United States belong to a different family. The bob-white is a good type. They nest on the ground, laying from ten to eighteen white eggs, but sometimes they perch on trees. They remain through the year and should be protected and fed, for they are helpful to the farmers in destroying many injurious insects. They are especially fond of the Colorado potato-beetle.

COMMON QUAIL

Qua'kers or **Society of Friends,** a sect founded by George Fox in 1648-66. In spite of severe and cruel persecutions the Quakers established themselves in England and in America. Although not a large denominaiion, they have exerted a strong and good influence on the public at large by their purity of life and the stand they have taken in great questions, as war and slavery. Friends began to protest against slavery as early as 1688, and in 1787 no known Friend owned a slave. As early as 1727 they commenced to censure the traffic in slaves, and opposed it more and more warmly, until the whole British nation felt the blow and set their slaves free. Their leading doctrine is that of "internal light." They believe that the Holy Spirit or the indwelling Christ alone maketh wise unto salvation and illumines the mind with true and spiritual knowledge of the things of God. Hence they do not consider human learning essential to a minister of the gospel, and have no theological schools or classes for students. Their ministers do not receive a salary, but bestow their labor freely, and in return are freely entertained when their work takes them away from home. The Friends have from the start, by example and precept, urged "plainness of speech, behavior and apparel;" and hence a Friend could always be distinguished by certain outward peculiarities, as "thee, thou, first month, second day," instead of the usual terms used, and by their quaint garb. In 1827 Elias Hicks denied the divine authority of the Scriptures, the divinity of Christ and His atonement, and carried with him about half of the Society in America. These are now known as the Hicksite Friends, while the remainder are called Orthodox Friends. The more eminent leaders of this sect have been George Fox, Robert Barclay, Thomas Ellwood, John Woolman, William Penn and John Bright. They number in the United States about 120,000; while about 20,000 of them are in England. See Fox's *Journal* and Sewell's *History of the Quakers.*

Quarantine (*kwŏr'an-tēn'*), ("a period of forty days"), is a forced abstinence from communication with the shore which ships are compelled to undergo when they are last from some port or country where certain diseases held to be infectious, as yellow fever, plague or cholera, are or have been raging. Where a quarantine is established, it is a punishable offense for any person in the suspected ship to come on shore or for anyone to disembark any merchandise or goods, except at lazarettos, which are estab-

QUAIL

lishments provided for the reception of goods or passengers or crew, and where such purifying processes as the sanitary science of the time prescribes are applied. Until a ship is discharged from quarantine, she displays a yellow flag at her masthead if she has a clean bill of health, a yellow flag with a black spot if not clean; at night a white light is shown at the same place. The permit to hold intercourse after performing quarantine is called *pratique*. Quarantine is not of necessity limited to a sea-frontier; it is enforced at the frontiers between adjacent states, and by cities and towns on houses in which are cases of infectious diseases.

Quar'rying is excavating stone, which may be done either by hand or by dynamite, blasting powder or other explosives. The art demands intimate knowledge of the structure of the rock to be excavated. This rock is commonly of one of two kinds, either stratified or igneous. The most important stratified rocks for quarrying are limestone and sandstone. The quarryman takes advantage of the bedding and natural cleavage of these rocks, so as to direct his efforts along the line of least resistance. Even some of the hardest of the igneous rocks, granite for example, have natural lines of cleavage, which may be utilized. The stratified rocks are split by means of a plug fixed in a hole in the rock between two wedges, known as "feathers." When the plug is hammered, the wedges operate on the stone with a great splitting force. This method, however, is only applicable to blocks of a limited size. Explosives, as dynamite and gunpowder, will loosen blocks of the largest description. Dynamite shatters the rock to such a degree that it is more serviceable in quarrying road-stone than building-stone. Sometimes a large block is cut off by a channeling machine, which cuts by means of a sharpened bar impelled by steam-power. When quarried, the stone is cut and dressed for use in building, statuary etc.

Quar'termas'ter, an officer whose duty is to provide quarter, provisions, storage, clothing, fuel, stationery and transportation for the army and to superintend the supplies. In the navy the quartermaster is a petty officer who attends to the helm, binnacle, signals and the like under the direction of the master.

Quartet', a piece of music arranged for four solo voices or instruments, in which all the parts are *obligato* — that is, no one can be omitted without injuring the proper effect of the composition. A mere interchange of melody, by which the parts become in turn principal and subordinate, without the interweaving of them, does not constitute a quartet. Quartets for stringed instruments are generally arranged for two violins, a viola and a violoncello, and are sonata in form — that is, have a progression of thought and movement. They originated with Haydn, and were further developed by Mozart and, notably, by Beethoven, who perfected the art of part-writing in music. Subsequent writers are Schubert, Spohr, Mendelssohn, Schumann and Brahms. Vocal quartets were a frequent feature in oratorios and operas up to the time of Wagner.

Quartz (*kwärts*), the name of the commonest mineral substance of nature. Chemically, quartz is silicon oxide (SiO_2). Quartz occurs in nature in the crystalline and the noncrystalline forms. When crystalline, it occurs in six-sided prisms terminated by pyramids. Well-developed crystals are most commonly found in veins or open spaces in rocks. By far the larger part of quartz, even that which is really crystalline, does not occur in the form of prisms but in the form of sand grains, pebbles etc., which themselves were derived from crystals. Quartz is one of the constituent minerals of most light-colored igneous and metamorphic rocks; is the chief constituent of most sandstone; and is an important constituent of most other sorts of sedimentary rock, except limestone. It is the hardest of the common minerals. Pure quartz is transparent, but it often contains impurities which give it distinctive and sometimes beautiful colors. Several varieties of quartz constitute gems, some of them of great value. Here belong *amethyst*, a transparent, purple variety of quartz; *agate*, the banded variety of quartz from which cameos are cut; *chalcedony*, a translucent variety; *smoky quartz; cat's eye quartz; jasper*, a red, opaque variety; various so-called *topazes* (not the true topaz); *rose quartz*, a pink or rose-tinted variety; and *rock crystal*, or crystals of pure quartz. *Flint* and *chert* are impure varieties of quartz.

Quassia (*kwŏsh'ĭ-ȧ*), from the name of a negro, Quassy or Quash, who prescribed this article as a specific for fevers — a bitter wood obtained from the various trees of the quassia family, all of which are natives of tropical America or the West Indies. The wood and bark are used as medicine. Cabinet-wood made from it is safe from all attacks of insects.

Quebec', Can. This, the oldest province of the Dominion, entered the federation in 1867. It has Hudson St. and Bay on the north; the Gulf of St. Lawrence on the east; New Brunswick, the United States and Ontario on the south; Ontario on the west.* Quebec has an area of 706,000 square miles; double that of France and Prussia combined, and very nearly six times as large as that of the British Isles.

*Newfoundland governs the coast of Labrador, which partly cuts off Quebec from the Atlantic.

Population 2,002,712 in 1911, nearly all Canadian in origin. The number of French is nearly five times as great as that of the British. The Roman church led numerically (1,429,260), then the Church of England (81,563), then the Presbyterian (58,013) and lastly the Methodist (42,014). Of the 150,600 occupiers of farm lands 135,625 are owners.

Climate. The climate is much like that of the other parts of eastern Canada, excepting, perhaps, that the winter is slightly colder; but the air is generally dry and bracing, the cold is not felt to be unpleasant, and the climate is exceedingly healthy.

Drainage. The St. Lawrence divides the province, and, below Quebec, begins to branch out to a noble estuary, when it reaches the Gulf of St. Lawrence. The latter forms the southern exit to the Atlantic (between Newfoundland and Cape Breton), while beyond the large island of Anticosti, at the mouth of the St. Lawrence, the Straits of Belle Isle form the northeastern exit. The St. Lawrence is navigable for ocean-steamships as far up as Montreal, and this brings Montreal 300 miles nearer to Liverpool than is New York. Ottawa River (*q. v.*), 780 miles in length, drains 80,000 square miles. The St. Maurice is navigable for 40 miles, and the Richelieu is provided with a canal to permit boats to pass from the St. Lawrence at Sorel to Lake Champlain and so to the Hudson. The Saguenay is world-famed as a picturesque river. Large vessels travel it for 60 miles, and its banks are precipitous and imposing. The Chicoutimi trip up the Saguenay is a favorite one for tourists.

Quebec has a number of beautiful lakes, notably St. John, Brome Lake and Lake Memphremagog, part of the last being in Vermont. Lakes St. Louis and St. Peter are expansions of the St. Lawrence.

Resources. The province has many thousands of miles of forestland, so that the lumber industry is very important. The production of woodpulp is one of the main industries. Much of it is exported to the United States. Quebec has shown wise foresight, in making extensive forest reserves. The soil is rich and loamy. Cereals, hay and root-crops grow everywhere in abundance. Indian corn, hemp, flax and tobacco are also raised in many parts of the province. Fruit is grown in quantities, especially apples and plums, which are exported largely. Small fruits, grapes and tomatoes are abundant. Cattlebreeding is carried on largely, and many thousands of animals are exported to Great Britain yearly, the region east and north of the St. Lawrence being especially excellent for pasturage. The fisheries in the St. Lawrence River and Gulf are very productive, and all the smaller rivers teem with fish. The province is rich in minerals. Iron is very generally distributed; lime-phosphates and minerals —lead, silver, platinum, zinc, copper and alluvial gold—are found in various places, and Quebec supplies two thirds of the world's production of asbestos. Agriculture and dairy-farming form the chief occupations, but manufactures, fisheries, commerce, lumbering, mining and shipbuilding employ a considerable part of the inhabitants.

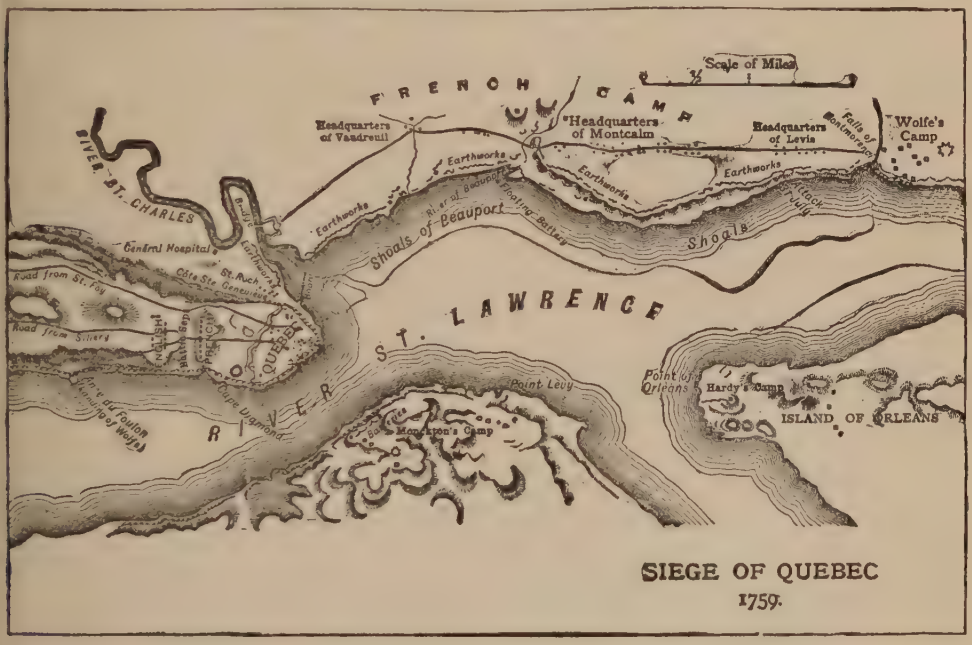
Transportation. The valley of the St. Lawrence and that of the Ottawa are fertile and well-settled. Railways run down both banks of the St. Lawrence from Montreal to Quebec and from Montreal west to Ontario and south to the United States. Ottawa is connected by three lines with Montreal. River navigation on the St. Lawrence and Ottawa is excellent. North of the St. Lawrence the settlement is not broad, for the Laurentian Mountains erect a barrier. The southern section of the entire province from the river to the United States boundary and east to Rimouski is thickly settled and dotted with thriving towns. Across the west of this southern section run railways from Montreal through New York, Vermont and New Hampshire to New York City, Boston and Portland.

Education. The public schools are under the control of two school-boards — one Catholic and the other Protestant — each of which enjoys absolute control of its own schools. The school-rates are levied separately, and the utmost freedom is enjoyed in religious exercises and the choice of books. The Roman Catholic population of the province is 80 per cent. of the whole. The French as compared with the English population of Montreal is as three to two. A magnificent agricultural college and experimental farm has been established at St. Anne's near Montreal, due to the generosity of Sir Wm. Macdonald of Montreal. It is doing great good in advancing the agricultural interests of the province. Two large and important universities, McGill and Laval, are doing excellent educational work in Montreal, and Laval, fortunate in having had Monsignor Mathieu as rector, is carrying on similar work in the City of Quebec. The attendance at McGill averages 1,300 students. Its faculties of medicine and applied science are especially strong. See LAVAL, MCGILL, MATHIEU and PETERSON.

History. Old Canada was the St. Lawrence valley, and the first settlements naturally were near the mouth of the river. Much of the romance of early Canadian history centers in Quebec. Here the first French explorers came and forced their way up the mighty river, which would, they hoped, prove a shorter route to the Indies. At Quebec and at Montreal they built their stockades and planted their settlements, and from these points went

all those daring expeditions of traders and missionaries up the Ottawa, to Georgian Bay, to the headwaters of the Mississippi and elsewhere into the unexplored land of the forest, the furbearing and the Indian.

The province is governed by a lieutenant-governor, who is appointed by the governor-general, a legislative council, consisting of 24 members appointed for life, and a legislative assembly of 82 members, elected every five years. The seat of the local government is Quebec. The province is represented in the Dominion senate at Ottawa by 24 members and in the house of commons by 65 members. The principal city is Montreal, the commercial metropolis of the Dominion. Quebec, the next city in importance, is the seat of local government and the most historic city in Canada. See *Quebec, Past and Present*, by Sir J. M. Lemoine; *Picturesque Quebec; Sketch of the Province* by Honoré Mercier; and Cassell's *Picturesque Canada*, edited by Principal Grant.



SIEGE OF QUEBEC
1759.

Quebec, capital of the province of that name, stands on a steep promontory of the St. Lawrence at its junction with St. Charles River, 300 miles from the Gulf of St. Lawrence and 180 below Montreal. Quebec is the most important military position in Canada. The citadel occupies an area of 40 acres and commands a magnificent view. The harbor is spacious, and the docks and tidal basin are perfect specimens of engineering skill. The city is divided into an upper and a lower town. In the latter are the banks, warehouses and stores. In the upper town are the principal residences, public buildings, churches, gardens and retail shops. Toward the west are the thriving suburbs of St. John, St. Louis and St. Roch's. The last has become a place of commercial importance, with immense warehouses and stores. To the southwest of St. John are the Plains of Abraham, the historic battlefield, where a column 40 feet in height has been erected to the memory of General Wolfe. Other monuments are dedicated to Wolfe and Montcalm, Champlain and Bishop Laval. Four martello-towers occupy elevated positions. In the upper town is Dufferin Terrace, 1,140 feet long and 200 feet above the water. A cantilever railroad bridge across the St. Lawrence here has twice collapsed in the course of construction, but will ultimately be completed. Principal buildings: Courthouse, postoffice, custom-house, city-hall, Laval University, masonic hall, basilica, archepiscopal palace, Anglican and French cathedrals, Church Hall, Young Men's Christian Association building and parliamentary and department buildings. Quebec is connected with all cities in America by lines of railroad, and on the St. Lawrence is, with Montreal, at the head of ocean-steamship navigation to Europe. Population 182,000. Consult G. Mercer Adam's *Illustrated Quebec* and Doughty's *Quebec Under Two Flags.*

Queen Char'lotte Islands, a group north of Vancouver Island, off British Columbia. Area 5,100 square miles. The two principal islands, Graham and Moresby,

have a length of 160 and a greatest breadth of nearly 70 miles. The climate is healthy, but very rainy. Anthracite, copper, iron-ore and gold-bearing quartz have been found, and forests abound. The inhabitants are about 1,000 Indians, who engage in fishing.

Queen Charlotte Sound is a strait separating Vancouver Island, B. C., Canada, on the north, from the mainland.

Queens'land. See AUSTRALIA.

Queens'town, a seaport of Ireland, on the south side of Great Island, in the harbor of Cork, 177 miles southeast of Dublin. Its original name was Cove of Cork; the present name is in memory of the visit of Queen Victoria in 1849. The town is built in parallel streets on the slopes of a hill shaped like an amphitheater. It is noted for its mild

and healthful climate. The splendid Roman Catholic cathedral for the Cloyne diocese is the principal building. Queenstown is an important port of call, the mails from the United States being landed here and sent overland to Dublin. Population 9,590, See *Harper's Magazine*, September, 1884.

Quere'taro (*kā-rā'tà-rō*), one of the inland states of Mexico with a city of the same name, is on a high plateau, 120 miles northwest of Mexico City and 350 from Vera Cruz. The area of the state is 3,556 square miles, with a population of 243,515. The population of the city, its capital, is 35,011. The town was taken by the Spanish from the Chichimec Indians in 1531. Here in 1867, Maximilian, Archduke of Austria and Emperor of Mexico, made his last stand, and here he was shot. The town is an important manufacturing center, and near it are some rich mines of silver, lead, iron and copper. The chief products, however, are maize, fruit and cotton, There are some fine public buildings and a church (that of Santa Clara), noted for its beautiful wood-carvings.

Quern (*kwērn*), a mill used in early times for grinding corn, the stone of which was turned by hand. It is a contrivance of great antiquity, and so well-adapted to the wants of a primitive people that we find it at the present day in remote districts of Ireland and in some parts of the Hebrides and Shetlands. The remains of querns have been dug up in Britain, Ireland and continental Europe wherever the traces of ancient population are found. The most usual form consists of two circular, flat stones, the upper one pierced in the center with a narrow funnel and revolving on a wooden or metal pin inserted in the lower. The upper stone is occasionally ornamented with various devices; in the Roman period it sometimes was funnel-shaped, with grooves radiating from the center. In using the quern the grain was dropped with one hand into the central opening, while with the other the upper stone was revolved by means of a stick inserted in a small opening near the edge.

Quick'sand (quick, *i. e.* living or moving sand), a tract of sand which, without differing much in appearance from the shore of which it forms a part, remains permanently saturated with water to such an extent that it cannot support any weight. Quicksands are most often found near the mouths of large rivers. They appear to be formed only on flat shores, the layer of earth under the sand being stiff clay, which water cannot pass through; and in narrow channels, through which the adjoining shore from its shape causes strong tidal currents to run, the sand may be kept so constantly stirred up by the moving water that a quicksand results. Quicksands are not commonly of great extent, and their danger has probably been exaggerated in the popular mind by sensational descriptions in works of fiction, as in the *Bride of Lammermoor* and in *Moonstone*.

Quick'sil'ver. See MERCURY.

Quil'ler-Couch', **A. T.,** English novelist, essayist and literary critic, was born in Cornwall in 1863, and early in his career was a classical lecturer at Trinity College, Oxford (1886-7). For the next ten years he was on the staff of *The Speaker* (London) or connected with it as a contributor. Some of his essays and reviews in *The Speaker* and elsewhere will be found in a collection under the title of *Adventures in Criticism* (1896). About ten years earlier he devoted himself to the writing of fiction, many of the characters in his novels, together with much of the scenery and traditions of his native county, treating of Cornwall. Among his novels are *Dead Man's Rock; Troy Town; The Mayor of Troy; The Splendid Spur; The Delectable Duchy; The Ship of Stars; Old Fires and Profitable Ghosts; The Adventures of Harry Revel; Hetty Wesley;* and *Sir John Constantine.* In 1904 he published *Fort Amity*, a story which treats of the stormy days of war with France in Canada. Besides completing Stevenson's unfinished romance of *St. Ives* and writing a monograph on George Eliot, Mr. Quiller-Couch has issued delightful verses and parodies under the title of

Green Bays, with *Poems and Ballads* and many charming short stories.

Quin, James, a celebrated actor of Irish descent, was born at London in 1693, and made his first appearance on the stage at Dublin in 1714. Shortly after, he was engaged at Drury Lane, London, but for quite inferior parts. In 1716, however, the sudden illness of a leading actor led to Quin being called to take the character of Bajazet in the once-famous play of *Tamerlane*. His success was marked. Next year he went to Rich's Theater at Lincoln's Inn Fields, where he remained as a principal actor for 17 years. The only really fine parts which he seems to have played were Captain McHeath in the *Beggar's Opera* and Falstaff in *The Merry Wives of Windsor*. In 1734 he returned to Drury Lane Theater "on such terms," says Cibber, "as no hired actor had before received;" and from this date until the appearance of Garrick in 1741 he was by universal consent the first actor in England. He died at Bath, Jan. 21, 1766.

Quince, the fruit of a species of *Pirus* (*P. cydonia*), a member of the rose family.

QUINCE

The species is sometimes regarded as entitled to separate, generic rank, and is then called *Cydonia vulgaris*. It is said to be a native of northern Persia, but is naturalized through the northern hemisphere. There are only three principal varieties in cultivation: Those in which the fruit is apple-shaped; those in which it is pear-shaped; and the so-called Portugal quince, which has very large fruit. The flavor of the quince makes it a favorite fruit for jellies and marmalade.

Quin'cy, one of the most progressive cities in Illinois, the county-seat of Adams County, is on the Mississippi, and was founded in 1822. It has steadily grown into a manufacturing city of considerable importance. Among the articles manufactured are stoves, farm implements, incubators, metallic wheels, stationary engines, engine supplies, furniture, clothing, carriages, paving and building brick, lumber and lime. In addition to several railroad lines, the city has river transportation. The public institutions include a library of 22,000 volumes, a fine courthouse, soldiers' and sailors' home, hospitals, churches, Federal building, Chamber of Commerce building, Masonic Temple, State Armory and many parks. The city has thirteen public school buildings with an enrollment of 5,000, twelve parochial schools with an enrollment of 2,500, two large business-colleges and several private schools. The city is noted for its beautiful shade-trees, paved streets and healthful situation on a bluff above the river. The population is 40,000.

Quincy, Mass., is a historic city and seaport of Norfolk County, on Quincy Bay. It is separated from Boston by the Neponset River on the north and from Weymouth by Fore River on the south. It is on the New York, New Haven and Hartford Railroad and the Old Colony Street Railway. It is noted for its granite, and for this reason is sometimes called the Granite City. Besides the granite industry its inhabitants engage in ship-building and the manufacture of rivets and studs, gears, telephone apparatus and foundrying. Besides an excellent system of public schools there are Woodward Institute (a secondary school for girls), Quincy Mansion School (a girls' boarding-school), Thomas Crane Library (public), a city-hospital and other civic and social institutions both public and private. Quincy is often called the City of Presidents, as it is the place of birth, residence and burial of John Adams and John Quincy Adams. It also is the birthplace of John Hancock. The population of Quincy is 40,000.

Quincy, Josiah, an American lawyer, was born at Boston, Feb. 23, 1744, and died at sea, off Gloucester, Mass., April 26, 1775. After graduating at Harvard in 1763, he studied law. He took a strong stand against the oppressions of the parliament of the mother-country and its violations of the rights of the colonists, and his name is associated with those of James Otis and Joseph Warren as men who had most influence in bringing about the Revolution. Although Quincy had a slender frame and ill-health, his gift of oratory, heightened by a voice of rare beauty and compass and an impassioned and graceful delivery, had great weight in public assemblies. When Captain Prescott and the soldiers who fired on the people in the Boston massacre of March 5, 1770, were arrested, Josiah Quincy and John Adams were applied to in their behalf to act as their counsel, and, although they earned great reproach by doing so, the acquittal of the prisoners on trial the next autumn justified their course. In May, 1774, he published his chief political work: *Observations on the Boston Port Bill, with Thoughts on Civil Government and Standing Armies*. In September, 1774, he went to England on a private mission for the popular cause, as also for his health. This visit excited much notice in London. He had interviews with Lords North and Dartmouth at their own request, had intercourse with Dr. Franklin and other friends constantly, and received the most bitter personal abuse from Lord Hillsborough. He returned early in the spring, against the advice of his physician, and died just before arriving. Almost his last words were

that he could die content if he had an hour's talk with Samuel Adams or Joseph Warren. See *Life* by his son, Josiah Quincy (1820).

Quinine (*kwī'-nĭn* or *kwĭ-nēn'*), is an alkaloid in the bark of numerous species of cinchona and in one species of remigia, its yield varying from 1½ to 8 per cent. Quinine is obtained from the powdered bark by treating it with lime; extracting the mixture with alcohol; neutralizing with an acid so as to obtain a salt of quinine; and finally purifying the product. Preparations of quinine, especially the sulphate, are largely used in medicine.

Quinoa (*kwĭ-nō'ȧ*), a valuable food-plant, a native of Chile and the high tableland of Mexico. In these countries it is much cultivated for its seed, which forms a principal food of the inhabitants. The meal made from some varieties of the seed has a somewhat peculiar flavor, but is very nutritious, and is made into porridge and cakes.

Quintil'ian, M. Fabius Quintilianus, was born about 35 A. D., at Calagurris in Spain, and attended the lectures of Domitius Afer in Rome. After 59 A. D., however, he revisited Spain, whence he returned to Rome in the train of Galba and began to practise as a pleader in courts, gaining considerable reputation. He was more distinguished as a teacher of oratory, however, and his instructions were eagerly sought, his pupils including the younger Pliny and the two grand-nephews of Domitian, who conferred the title and insignia of consul. After 20 years of labor as advocate and teacher, he retired to private life and died about 95 A. D. His reputation rests securely on his great but mutilated *Institutes of Oratory*, a complete system of rhetoric. It was written after he had ceased to be a teacher, and was the fruit of two years' labor, as he says in his preface. The best edition of Quintilian's work is that of Burmann. There also are special editions of the tenth book, a masterly criticism of classic literature that ranks Quintilian with the great critics.

Quipu (*kē'pōō*), the language of knotted cords which was used by the Incas of Peru previous to the conquest by the Spaniards. A series of knotted strings was fastened at one end to a stout cord; the other end hung free. This was used for the purpose of conveying commands to officers in the provinces and even for recording historic events.

Quito (*kē'tō*), the capital of Ecuador, lies almost on the equator, on the east of a great plateau, at the foot of a volcano and at an elevation of 9,351 feet. The appearance of Quito is picturesque, with beautiful mountains on every side. This, with its clear, healthy and temperate climate maintaining perpetual spring, makes it one of the most charming cities of South America; yet the abrupt changes from the hot sun of midday to the chills of evening make pneumonia and diseases of the chest very common. Public buildings include a university, seminary, institute of science, observatory, museum, library of 20,000 volumes, cathedral, archbishop's palace, city-hall, capitol, a penitentiary, hospital, lunatic asylum, retreat for lepers, a score of churches and three times as many monasteries. Most of these are in a dilapidated condition, for which it is hard to find any reason but laziness; for they retain their lands and revenues, and the offerings of the faithful, who nearly all are Indians are as constant as ever. Indeed, Quito is the paradise of priests and church bells jangle all day long; for Ecuador is the pope's most faithful province and the one state which refuses to recognize the unity of Italy and the condition which resulted from the occupation of Rome. There are only two or three good stores and no hotels; the daily market in the square before the monastery of San Francisco is the general purchasing place; and the religious houses serve for hotels. Quito was founded in 1534, and has suffered frequently from earthquakes. Population about 80,000, mainly Indians and Mestizos (half-Spanish or Creole and half-Indian). See ECUADOR.

WILD RABBIT

DUTCH RABBIT

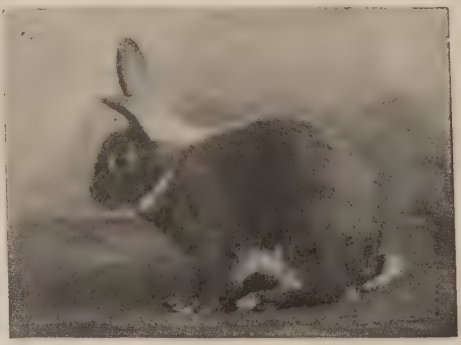
BELGIAN RABBIT

ENGLISH RABBIT

HARE

LORRAINE RABBIT

JAPANESE RABBIT



BLUE AND STRAW COLOR

R

R (*ăr*), the eighteenth letter, is a voiced consonant. Sometimes it is made between the hard palate (or the teeth) and the tip of the tongue, as in *array*, *rise*, *trace*. This is dental *r*, employed before a vowel and usually rolled or trilled. Sometimes *r* is made with the upper surface of the tongue on the back of the hard palate. This is palatal *r*, as in *arm*, *raw*, *war*. Sometimes *r* also is a semi-vowel, sometimes a liquid. *R* is closely related to such mixed vowels as *u* in *up* and *urn* and *e* in fern. The Scotch and Irish roll *r* strongly, but the Chinese cannot even say it, substituting *l*.

Rabat (*rä-bät'*), also called New Sallee, a seaport city of Morocco, Africa, is situated on the south side of the Bu-Regreg, where it empties into the Atlantic. The most conspicuous object in the town is the tower of Beni-Hassan (180 feet high); and near it is the ruined mosque of Almanzor, originally intended to be the largest in the world. Formerly Rabat was the center of European trade with Morocco; but, owing to the silting of the mouth of the river, its commerce has greatly declined. Its chief exports are goat and sheep skins, hides, wool, almonds, wax and gum. In 1906 its exports were £96,677; its imports £332,644. Population 26,000.

Rab'bi, an honorary title applied to teachers and masters of the Jewish law, being in common use in the time of Christ, who was frequently addressed as such by his disciples. Other forms of the same title are *Rab*, master; *Rabban*, our master; and *Rabboni*, my master.

Rab'bit, a rodent with long ears, belonging to the same genus as the hares. The smaller burrowing varieties are called rabbits; the larger ones and those that do not construct a burrow are called hares. Hares are born with fur and open eyes; rabbits, naked and blind. A typical hare is large, has long ears and legs, is a swift and tireless runner; rabbits are small, have short ears and legs, and are not strong runners. Both hares and rabbits have numerous enemies, who cause their timidity and tremors. The so-called jack-rabbit really is a jack-hare. The cotton-tail is a typical rabbit. They feed on grass, herbs and tender bark. Those in captivity will eat nearly all kinds of vegetables and at times should be given dry food, as shelled corn. The tame rabbits have been modified and varied by selection and breeding. They multiply rapidly, having from four to eight litters a year. They were introduced into Australia about the middle of the 19th century and into New Zealand in 1860. They multiplied till they were a great menace to the crops and to vegetation. The government offered a bounty for their skins, and in a single year more than twenty-five millions were killed in New South Wales alone. The skin is of little value, but the hair has been used in making the body for felt hats. See HARE.

Rabelais (*rä'b'-lä'*), **François,** the greatest of French humorists, was born, according to the general statements of biographers, in 1493, but more probably a few years earlier, near Chinon, a small town in Touraine. At the request of his father he became a brother of the Order of St. Francis in the convent of Fontenay-le-Comte about 1519, and devoted himself with the utmost ardor to his hitherto neglected studies. To medicine in particular he seems to have been strongly attracted, and, in addition to Latin and Greek, he is said to have mastered Italian, Spanish, German, Hebrew and Arabic. Charged with heresy on account of his devotion to learning, he left the convent, and later was a monk of the order of St. Benedict, then lecturer in the University at Montpelier and finally canon of Cardinal Bellay's abbey near Paris. He died at Paris, April 9, 1553. Rabelais' great romance, in which are narrated the adventures of Gargantua and Pantagruel, continues to hold its rank as a masterpiece of humor and grotesque invention. In form a sportive and extravagant fiction, it is a pointed criticism of the corrupt society of the period, the follies and vices of which are pictured with marked ingenuity and effect; but, at the same time, on account of its free tone and plainness of speech few books are less suitable for general perusal. Rabelais also ranks among the theoretical reformers of education.

Raccoon (*răk-koon'*), a tree-climbing, nocturnal animal belonging to the bear family and restricted to North and South America. The common "coon" of the United States is widely distributed. It has a stout, clumsy body about two feet long without the tail, which is about a foot in length.

COMMON RACCOON

The long, coarse hair of the body is grayish-brown, and the tail is ringed with black and white. The raccoon has a broad head and a pointed muzzle, and the face is crossed by a dark band which includes the eyes. The home of the animal is usually high up in the hollow of a large tree; here it rests by day and hibernates through the severe winter-weather. It is active at night, and, during the season of young corn, is often very destructive to the green ears. Besides corn, in season, its usual food is fish, crayfish and various mollusks, though it also eats mice, insects, fruits, small birds and eggs. It has the curious habit of washing or dousing its food repeatedly in the water, and by the Germans is therefore called the wash-bear. The common raccoon of South America is called the crab-eating raccoon. A coon-hunt on a moonlight night, with torches and dogs, is a common form of sport in the southern United States.

Ra'ces of the World. The most general division of the human family is into five great races: the Caucasian, the Mongolian, the Malay, the Ethiopian and the American. The Caucasian race is the most numerous and the most widely spread over the earth of all the races. It is distinguished by a fair complexion, a high forehead, straight hair and a beard varying in color. This race is dispersed over nearly the whole of Europe and North America, northern Africa and large areas in Asia, Australia and southern Africa. It leads the other races in literature, commerce and all the arts of civilization. The Mongolian race has a yellowish complexion, small eyes, prominent cheek-bones and rather coarse, black hair. It comprises the Chinese, the Japanese, the Turks and many other nations in Asia, with the Magyars of Hungary and the Esquimaux of North America. The Malay race has a dark-brown complexion, with a skull like the Caucasian; a flat face like the Ethiopian; and straight, dark hair like the Mongolian. This race is found in Madagascar, Australia, the islands of the Pacific and the Malay Peninsula of Asia. The Ethiopian or African race has a black complexion, a rather low forehead, a broad, flat nose, thick lips, thin beard and woolly hair. It inhabits the greater part of Africa, although it has ten million representatives in North America. The American race (Indians) has a red or copper-colored skin, high cheek bones, coarse, black hair and scanty beard. It is found in certain portions of North America and South America. The population of the world may be estimated in round numbers at 1,500,000,000, of which more than 1,000,000,000 belong to the Caucasian and Mongolian races. Various divisions and subdivisions of these races have been made by ethnologists durng the last twenty-five years.

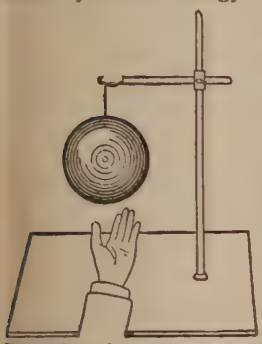
Ra'chel, properly **Elisa Rachel Felix,** the great French tragic actress, was born of Jewish parents at Mumpf, in the Swiss canton of Aargau, March 24, 1820. She had her first lessons in singing at Paris about 1830, when her parents took up residence in that city, and in 1838 appeared as Camille in *Les Horaces* in the Thèâtre Français. From this time she shone without a rival; and the furore excited in Paris in 1848 by her recitation of the *Marseillaise* will continue to connect her name with the Revolution of that year. In 1849 she made the tour of the French provinces, and afterwards visited London, St. Petersburg, Berlin and other great cities of Europe, everywhere meeting enthusiastic admiration and applause. In 1855, while on a professional visit to America, her health gave way, and she returned home utterly prostrated, her death taking place at Cannes, near Toulon, Jan. 3, 1858. As an artist, within the limits prescribed by her genius, Rachel has never been surpassed. No language can give an idea of the force and intensity which characterized her rendering of passion. Her *Phèdre*, by common consent her masterpiece, was the incarnation of agony, not to be forgotten by anyone who ever heard it. "She does not act — she suffers," a fine critic has observed of her. But in spite of her great genius she was never tenderly loved, being grasping and avaricious. She left a large fortune, besides the amounts lavished upon her family during her life.

Racine', Wis., is a prosperous manufacturing city at the mouth of Root River, 23 miles south of Milwaukee. Racine's position on a bluff, fifty feet above Lake Michigan, gives an excellent drainage as well as a beautiful view of the lake. Racine is noted for the manufacture of wagons, thrashing-machines, boots, shoes, boilers, engines, boats, malleable iron and automobiles. There are three banks, a public library and an excellent system of public schools. Population 38,002.

Racine (*rȧ' sĕn'*), **Jean Baptiste,** the greatest dramatic poet of France, was born at La-Ferté-Milon, in the modern department of Aisne, in December, 1639. His parents dying when he was very young, he was cared for by his maternal grandfather, being sent first to Beauvais College and afterwards to Port Royal, at which he studied diligently under such masters as Claude Lancelot, Nicole and La Maitre. At 19 he left Port Royal to pursue a course of philosophy at the Collège d'Harcourt, where he appears to have first felt the attractions of a life devoted to letters and to have become intimately acquainted with various actors and actresses. Racine's earliest play was acted by Molière's company at the Palais Royal theatre in June, 1664, and in the same year he received from the king a pension of 600 francs for a congratulatory ode. The next fifteen years Racine devoted to writing plays, and pro-

duced a number of works, all of which bore the stamp of very high, if not the highest, genius. His last production, *Phèdre*, which appeared in 1677, was the one in which Rachel's genius, in the 19th century, reached its highest manifestation. His chief writings are *Esther*, *Athalie*, *Phèdre*, *Bajazet* and *Iphigénie*. He died at Paris, April 21, 1699, and was buried according to his own request at Port Royal.

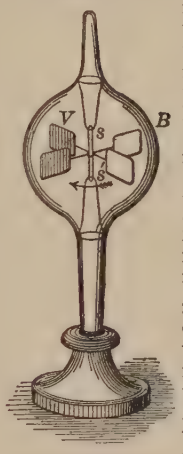
Ra'dia'tion, one of the fundamental processes by which energy is transmitted from one point to another. The word is sometimes used also to denote the quantity of energy transmitted as well as the process. If one consider the incandescent carbon filament of an ordinary electric lamp and hold his hand under either at the side of or underneath it, the sensation of heat is distinctly recognized. The same is true when the hand is placed some inches underneath a heated ball which is emitting no light at all. The query arises as to how the heat gets from the ball down to the hand. It certainly is not by conduction, for air is one of the very poorest of conductors. Nor can it be by convection, for convection-currents heat only the regions above the lamp or ball. Now it has been proved by elaborate series of experiments, extending over the entire 19th century and performed by Herschel, Prevost, Carnot, Melloni, Balfour Stewart, Kirchhoff, Hertz and others, that this "something" which passes from the ball to the hand behaves exactly as light-waves behave in nearly all particulars. It travels with the same speed as light, can be polarized as light, can be reflected and refracted as light, etc. The unavoidable inference, therefore, is that that which we call heat in the ball and heat after it is received by the hand is *not* heat while traveling from the ball to the hand, but is a wave-motion in the ether just as light is, the principal difference being that the heat-waves are longer than the light-waves. This is a process known as *radiation*, and the energy thus transmitted, whether in the form of long heat-rays or luminous rays or so-called actinic rays or electrical vibrations, is all grouped under the head of *radiant energy*. The student should distinguish carefully between *heat*, which is the energy of motion resident in atoms and molecules of ponderable matter, and radiant energy as defined above. See Balfour Stewart's *Treatise on Heat*.



Radiation of heat downward from a hot iron ball

Rad'icalism is the name generally applied to the principles of those who wish for fundamental political and social reforms. Radicalism, therefore, is the logical antithesis to conservatism. In England radicalism is recognized as the political principle of an organized party. The first English radical leader was John Wilkes; but it was not until the days of Mill, Bentham and Ricardo that radicalism had a definite philosophy of its own, nor did it become a very important political principle until after the Reform Bill of 1832. When that bill had been passed, there came about a gradual division between the Radicals, who looked upon it as a mere beginning to a series of reforms, and the Whigs, who were satisfied with the results of the bill and wished for the time to go no further. Since the rise of a separate Radical section within the body of the Liberals or Whigs, radicalism has become closely connected with socialism. There is a very strong radical body in France, and recently a similar movement has developed in Germany.

Radiometer (*rā-dĭ-ŏm'ē-tĕr*), an interesting device invented by Sir William Crookes in 1873, while determining the atomic weight of the then recently found element called thallium. In the form in which Crookes left it the essential features are a windmill of four light mica-vanes placed in a glass-bulb B from which the air has been very completely, but not too completely, exhausted. The proper degree of exhaustion is that in which the mean free path of the molecules is a little greater than the perpendicular distance from one of the vanes to the wall of the glass-bulb. As shown in the figure, the vanes are blackened on one side; and when sunlight or even lamplight is allowed to fall on the instrument, the vanes showing the blackened sides are more heated than the others, and hence the molecules between the blackened vanes and the glass wall bombard the vanes away, giving rise to the rotation indicated by the arrow in the figure. Only recently the radiometer has been made an instrument of precision, principally through the labors of Prof. E. F. Nichols of Dartmouth College. For a description of this instrument see *Astrophysical Journal*, March, 1901, pp. 101–41.



RADIOMETER

Radiomicrometer (*rā'dĭ-ō-mī-krŏm'ē-tĕr*), an instrument of marvelous sensibility for detecting radiation. It consists essentially

of a thermoëlectric couple suspended between the poles of a strong permanent magnet. The thermoëlectric couple is a part of a short electric circuit, all of which is freely suspended. When one junction in this circuit is exposed to radiation, an electric current is produced and the suspended coil rotates exactly as does the coil in an ordinary D'Arsonval galvanometer. (See GALVANOMETER.) To the suspended coil is attached a mirror by which this rotation may be measured. The instrument in its present form was suggested by D'Arsonval and perfected by C. V. Boys, in whose hands it has been made so sensitive as to detect the radiation of a single candle two miles away. For its use as an instrument of precision see article by E. P. Lewis in *Astrophysical Journal*, June, 1895, pp. 1–25.

Rad'ish, a name applied to species of *Raphanus*, a genus of the mustard family, and especially to *R. sativus*, long cultivated, principally for its fleshy roots. It is native to the Old World and many garden varieties have been developed, which may be classed in general as long-rooted and turnip-rooted varieties.

Ra'dium is an elementary metallic substance, so called because it emits rays which render luminous sensitive objects on which they are thrown. It was discovered by Professor Pierre Curie of Paris University and Madame Sklodowska Curie, his wife.

Radium is present in very small quantities in ores containing uranium, the most important being pitch-blend, found in Austria, Sweden and England; carnotite, in Colorado and Utah; autunite, in France, Portugal, etc. The tremendous cost ($120,000 per gram, or 15 grains, of radium element), is due to the long and tedious process necessary to extract the very small amount present in the ore. To produce 2 to 5 centigrams (about 1/3 to 3/4 grains) requires 1 ton of ore, 5 tons of chemicals and 50 tons of water.

Radium, and other like substances, possess what is known as radio-activity, caused by a spontaneous disintegration of the atoms, somewhat akin to an explosion. This property manifests itself by certain phenonema, as the generation of heat, electricity, the evolution of an active gas, the projection of invisible and penetrating rays, and by light. When a tube containing a radium salt is taken into a dark room it glows with a beautiful soft radiance. Radioactive substances also cause electrified bodies to discharge their electricity; they excite phosphoresence in certain minerals, as willemite, zinc sulphide and the diamond; they act upon photographic plates in a manner similar to ordinary light and the X-rays. Their rays penetrate substances opaque to ordinary light, even passing through a half inch of steel, a foot of solid iron or six inches of lead; and finally, they cause certain changes in the tissues of the body.

The first product of the disintegration of radium is a gas called the "emanation," which in turn, step by step, changes into other elements, called radium A, radium B, etc. This is the transmutation, or conversion of one element into another, hitherto believed impossible. During these changes three kinds of rays are produced, called alpha, beta and gamma. The alpha rays are atoms of helium having charges of positive electricity and are projected with a velocity 1-20 that of light. Their flight can be observed through an instrument called the spinthariscope. The beta rays are atoms of negative electricity or electrons (see ATOM), while the gamma rays are pulsations transmitted through the ether with the velocity of light.

In spite of the fact that a grain of radium bromide expels every second about ten thousand million alpha-particles, it has been estimated that it would take many thousand years before the complete disappearance of the salt.

Many extravagant claims have been made that in radium has been found a cure for cancer. These claims I have carefully considered and with Dr. William Seaman Bainbridge, Surgeon to the Hospital, I have spent much time at the medical centers abroad that are testing radium. My conclusions are, that while of great benefit in certain forms of cancer, there is but one universally recognized cure—the *early* use of the knife. It will take years of careful study to determine the true value of radium in the treatment of cancer. It has proved beneficial in the treatment of superficial cancer, lupus, keloid and kindred conditions.

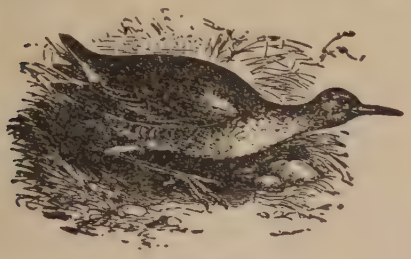
WORTHINGTON, SEATON RUSSELL, M. D.
Research Fellow and Chief X-Ray Department, New York Skin and Cancer Hospital.

Rae (*rā*), **John,** Arctic traveler, was born near Stromnes on the Orkney Islands, north of Scotland, in 1813, and, after studying medicine at Edinburgh, went to Hudson Bay as physician of the company's ships. In 1845 he undertook an exploring expedition and in 1846–7 a more extensive one, wintering in Repulse Bay. He was second in command on a search-voyage for Franklin in 1848; and five years later commanded an expedition that proved King William's Land to be an island. In his journeys he traveled more than 1,800 miles over regions never before explored. He died at London, July 24, 1893.

Raf'fia is a strong, supple fiber, obtained from the jupati palm, native of South America, and from allied palms in India and Africa. Raffia is extensively used in nurseries and gardens for binding plants and young trees to stakes, that they may grow erect and produce better fruit by greater sunlight being thus afforded. Raffia is also used extensively for mats and even for clothing. Its fiber, though coarse, is very strong and durable.

Raikes, Robert. See SUNDAY-SCHOOLS.

Rail, any one of a group of shore-birds found in marshes. They have the habit of skulking, instead of taking to wing, when pursued, and, therefore, are more frequently heard than seen. They are extremely shy. They have slender bills and long powerful



RAIL

legs; are small or of medium size; the body is wedge-shaped, allowing the creatures to make their way through close, marshy undergrowth. Although the wings are short and rounded, the birds in their migrations cover great distances. They are united with the coots into one family, but the toes of the rails are completely divided, those of the coots are lobed. The Carolina rail or sora is the most common one in the United States. It is found in the whole of temperate North America, but is more abundant east during migration, as it breeds chiefly in the northern part of its range. It is about eight and one half inches long, with the upper parts olive-brown, streaked with black; the breast is slaty and the belly white. The Virginia rail also is common. The king-rail or freshwater mud-hen is the largest and finest of the American true rails, being about 17 inches long. It is common in some sections of the United States. The yellow and the black rails are less common. The common water-rail of Europe is found in marshy districts of the British Isles and many parts of Europe. Like the American rails, it nests in the grass.

Rail'roads'. The origin of these mighty agents of commerce and civilization may be traced to a contrivance for carrying coal from the mines in Northumberland and Durham, England, to the places of shipment on the Tyne and Wear. It consisted of two parallel lines of wooden beams or trams fixed to the ground and furnished with flanges to prevent the wheels of vehicles from slipping aside. The date of the invention of these tramways is not certain, but it may be safely referred to the first half of the 17th century. The first step in improvement, which was covering the wooden beams with long strips of iron, was taken about 1700; and a second and more important improvement which followed some years afterwards was the substitution of cast-iron rails fixed on wooden sleepers laid crosswise. This kind of railway became pretty general in mining districts during the 18th century; but on account of the opening of canals and from other causes it was not considered practicable as a general means of travel and transportation. After the introduction of cast-iron rails, instead of a single wagon the plan of linking several smaller wagons was adopted. This was the germ of the modern railway train. The next improvement consisted in putting flanges on the wheels instead of the rails, which secured much greater facility of transit. But, as no more rapid or powerful means of locomotion had been invented than horse-power, many persons labored to devise some sort of steam apparatus for the purpose. The merit of inventing a self-acting steam carriage is due to Richard Trevethick, who in 1802 took out a patent for a steam locomotive which successfully drew wagons on rails. Trevethick's invention, however, was too imperfect to come into general use, and for a few years little or no improvement was made upon it, chiefly on account of the mistaken notion among engineers that the steam locomotive could not be made to draw a heavy load or acquire great speed unless it were provided with cogged wheels to work on a corresponding rack along the rails. That locomotives with smooth wheels running on smooth rails could draw heavy loads even up a moderate incline was established by Mr. Blackett, a coal proprietor on the Wylam Railway, in 1811; and nothing was now lacking but the means of obtaining speed.

Locomotive power was first employed by George Stephenson in 1814 on the Killingworth Railway, and with such success that it was afterward applied on the Stockton and Darlington Railway, which was the first railway in which carriages for passengers were used; but for some time its trains could not be made to move much faster than a horse walking. Stephenson, after a number of experiments, overcame this difficulty by sending the waste steam up a chimney, so as to cause a powerful draught in the fire. A rapid generation of steam was the result, and from this device, in connection with the multitubular boiler, the locomotive of the present day, with its wonderful power and energy, has been derived. But it was some time before the public mind could be brought to consider the question of the general use of railways, and it was not until 1830 that the line from Liverpool to Manchester was formally opened.

The first railroad constructed in the United States was in 1826, and was for the purpose of carrying granite from the quarries near Quincy, Mass., to tidewater, a few miles distant, and next year the legislature of Maryland chartered the first

railroad company authorized to do a general business in carrying freight and passengers. This was only 81 years ago, and such has been the progress in railway enterprise in that period, especially since the close of the Civil War, that on Dec. 31, 1911, there were 242,860 miles of railroad in the country, representing total assets of over $21,696,738,000. The total railroad mileage of the world has been estimated at 562,780 miles, and the value of all the roads at $39,000,000,000. The mileage of the principal countries in round numbers is as follows: Austria-Hungary 25,173; France 29,716; Germany 36,686; Great Britain and Ireland 23,205; Italy 10,388; Russia (European and Asiatic) 41,136; Spain 9,227; Switzerland 2,969; India 29,097; Canada 22,966; Sweden 8,321; Japan 4,898; Mexico 14,857; Argentine Republic 15,476; Brazil 11,940; Chile 3,288.

The longest continuous railway line on the American continent is that of the Southern Pacific Railroad; its main line from New Orleans to San Francisco is 3,149 miles. The Siberian Railroad (*q. v.*) has a mileage of 4,775 miles and, with its feeders and branches through Manchuria to Vladivostock and Port Arthur, a length of 6,667 miles from St. Petersburg.

Rain is caused by whatever lowers the temperature of the air and causes a part of the watery vapor, with which it is saturated, to assume the liquid state. Various causes may conspire to effect this object, but the most important of these originate in winds and other movements of the atmosphere. The more important principles regulating the relation of the winds to the rainfall are these: (1) When the winds have traversed a considerable extent of the ocean before reaching land, the rainfall is large; (2) when the winds, on arriving at the land, advance into higher latitudes or into colder regions, the rainfall is greatly increased because the air is brought below the point of saturation more rapidly; (3) if the winds, on arriving at the land, at once advance into warmer regions, the rainfall is small; (4) if the winds travel across a range of mountains, the rainfall is largely increased on the side facing the winds but reduced on the other side. There are certain places where rain rarely or never falls, as the coast of Peru in South America, the great valley of the River Colorado in North America, the desert of Sahara in Africa and the desert of Gobi in Asia; while, on the other hand, in such regions as Patagonia it rains nearly every day. In all places within the tropics where the trade-winds are blowing regularly and constantly rain is of very rare occurrence, the reason being that, as these winds come from a higher latitude, their temperature is increasing and consequently they take up moisture rather than part with it; and the return trade-winds, which blow above them in an opposite direction, having previously parted with their moisture, are dry and cloudless. When, however, these winds are forced up mountain ranges, as is the case on the east of Hindustan, they bring rain, which falls chiefly during the night, when the earth is coolest. In respect to rainfall Europe may be divided into two distinct regions — western Europe and the countries bordering on the Mediterranean. As the southwest winds, which are the return trades, descend to the earth and blow over the surface of Europe, it follows that the western parts, especially where mountain ranges stretch north and south, are rainy districts. Hence the rainiest regions of Europe are Norway, Ireland, the west of England and France, and Spain and Portugal. On the coast of the Mediterranean it rarely rains in summer, but frequently in winter. In Italy the quantity diminishes as we approach the south; and south of the Alps six times more rain falls with the northeast than with the southwest winds, the exact reverse of the case in England.

The manner of the distribution of rain in the United States is very different from what it is in Europe. The Rocky Mountains in North America are so high as to present an effectual barrier to the passage of the trade-winds which blow over the Gulf of Mexico, by which means they are turned northward and spread themselves over the country, especially the low basin of the Mississippi. When they have blown for some time, vast accumulations of heat and moisture take place, and sometimes great storms arise in consequence, sweeping eastward across the land and in many cases crossing the Atlantic and descending with violence on western Europe. It appears, in short, that the south winds from the Gulf of Mexico spread the moisture over the country, and the northwest winds separate this moisture from them by getting below them and forcing them into the higher regions of the atmosphere. As a consequence of this the heaviest rainfalls are in the valleys and the lightest on higher grounds. Thus the greatest amount of rain falls in Florida, the low flats of the Mississippi and along its valley; and the least quantity on the Alleghanies, especially on their higher parts, and on the high grounds of the Missouri River. In the northern states the quantity diminishes considerably, and the mode of its distribution is more similar to that of Europe.

Rain'bow', an optical phenomenon of great beauty appearing in the sky when rain is falling from clouds opposite the sun. It consists of a number of concentric arcs whose successive colors are arranged in the same order as the colors of the solar spectrum. There usually are two bows: an upper and a lower. The lower one is always

the brighter and is called the *primary* bow; the upper is often very faint, and is called the *secondary* bow. In the primary bow the colors begin with red at the top and end with violet at the bottom; in the secondary bow the order is just reversed.

The explanation of the rainbow was first given by Antonio de Dominis, archbishop of Spalatro, about 1600 A. D., who showed that a glass sphere filled with water would reflect a parallel incident beam of light in such a way as to produce a complete rainbow on a screen surrounding the source of light; but this explanation was, of course, incomplete until Newton proved that color is not produced at the refracting surface but is due to the decomposition of white light. This experiment of Dominis can be repeated by going into the Cave of the Winds at Niagara Falls where, on a bright day, the parallel incident beam and the complete rainbow of 360° are easily obtained, the particles of spray replacing the glass-bulb filled with water. The primary bow is produced by rays which have undergone *one* internal reflection; the secondary by rays which have suffered *two* internal reflections. The angular width of the primary bow is twice 42° 2′ for the red rays; and twice 40° 17′ for the violet rays. The corresponding angle for the red rays of the secondary bow is 50° 57′; and for the violet rays 54° 07′. For the details of the reflections and refractions here occurring see any good textbook of physics, as Watson's.

Rain-Gauge, an instrument employed by meteorologists to measure the depths of water deposited by rain during any assigned period. In its ordinary form it consists of a funnel, with a mouth of known area, for collecting the rain-water in a graduated glass vessel where its mass can be easily determined. Knowing the mass of water precipitated and the area over which it was distributed, the depth may be easily calculated. Several forms of self-registering rain-gauges have been devised, for which see any good treatise on meteorology.

Rainier (*rā′nēr*), **Mount.** This mountain is in the southwest of the state of Washington, in the Cascade Range. It is higher by 10,000 feet than the surrounding mountains, from which it rises in an almost perfect cone to the height of 14,526 feet above sea-level. Its crater still gives out sulphurous fumes, but the deep gullies that the waters have worn in its sides and the mighty forests that surround its base show that the last eruption was in some far distant time. No less than 14 glaciers move slowly down its sides; and the ascent is very difficult. The mountain is also called Mount Tacoma. In height it is second only to Mount Whitney among the mountains of the United States, south of Alaska.

Rain'y Lake, a lake forming part of the boundary line between the Canadian Dominion (province of Ontario) and the United States. It lies 100 miles west of Lake Superior, and is about 55 miles in length. It discharges its waters through Rainy River into Lake of the Woods.

Rainy River, a town on the river of the same name and the main line of the Canadian Northern Railway. It is the first divisional point on that line east of Winnipeg, and is important as the center of the sawn-lumber industry. The timber on the American and Canadian sides of the river is floated to this point to the mills. The Rainy River Lumber Company employs 450 hands. The Rat Portage Lumber Company employs 200 hands. The town has steamboat connection with Kenora and Fort Frances. Population 2,500.

Rai'sins, dried grapes of various kinds and well-known in the market. The raisin industry has long been developed in the Old World, but has recently become an important industry in California.

Rajah (*rä′jä*) is a Sanskrit word meaning king. Originally it was a title given to princes of the Hindu race who governed a territory, whether independent or not. Now the title is given to all Hindus of rank; even landowners of inferior caste not infrequently are given or assume the title. Native princes now as a rule assume the title of *maharajah*, meaning great king.

Raleigh (*ra′lĭ*), **N. C.,** capital of North Carolina and named after Sir Walter Raleigh, is situated on Neuse River, a little less than 200 miles from Richmond. It is built on an elevated site, with a central Union Square, from which four principal streets radiate, each 100 feet wide. In the square stands the capitol, a large granite building, costing over $500,000. The city also contains other state institutions and various manufactories. These consist of flour, cotton and cottonseed-oil mills, car and machine shops, phosphate, agricultural implements and carriage works and foundries. Raleigh has splendid public schools, both for colored and for white pupils, the state College of Agricultural and Mechanic Arts, the state institutions for the blind (white and colored), and the state Deaf and Dumb School. Near the city is the state university. Raleigh has the service of four railroads. Population 19,218.

Raleigh, Sir Walter, was born at Hayes, Devonshire, England, in 1552. He entered Oriel College, Oxford, in 1566 but left in 1569, without taking a degree, to serve in the Huguenot cause in France. In 1580 he distinguished himself in the suppression of the Irish rebellion in Cork, and two or three years afterward was introduced to court and became a favorite of Queen Elizabeth. Raleigh's tall and handsome figure, his dark hair, lofty forehead, resolute bearing, alert expression and spirited wit combined to form an imposing personality, and all the advantages that nature had given him were height-

ened by a gorgeous splendor in dress and jewels. But, as he was proud, haughty and impatient, he made hosts of enemies and was never fully admitted to the queen's counsels in reference to matters of state. The playful name of Water, which she applied to him, would indicate that she appreciated that instability of character which was his great fault and in the end worked his ruin. She, however, lavished numerous favors upon him throughout her reign, permitting him to send out and command various expeditions to the New World. His vessels scoured the seas in privateering enterprises, which at once gratified his inborn hatred of Spain and helped to provide the means for his various ventures in Virginia. Raleigh was in Ireland when the Armada (1588) appeared in English waters; but he hastened to the south of England to superintend the coast defense, and was present with the fleet throughout that week of toil and triumph. In June, 1596, he sailed in the expedition under Howard and Essex to Cadiz, and it was his counsels that governed the whole plan of action that for a second time shattered the naval power of Spain. Raleigh continued to enjoy the favor of Elizabeth until her death in 1603; but James I came to the throne with deep-seated prejudices against the gallant courtier, and in a short time stripped him of his offices. Raleigh was also arrested and tried for taking part in a conspiracy against the king's life, the only witness against him being the miserable Lord Cobham, who made and unmade his eight different charges with such facility as to make them of no value at all. "But one thing," says Kingsley, "comes out of the infinite confusion and mystery of this dark Cobham plot, and that is Raleigh's innocence." He was, however, condemned to death, and only on the scaffold was his sentence commuted to imprisonment for life. After remaining in London Tower for 13 years Raleigh was released for the purpose of leading an expedition to the Orinoco River, in search of a gold-mine, which, he said, existed there. He pledged himself not to come into collision with Spain; but some of his men, while he was sick aboard his ship, attacked a Spanish village and burned it to the ground. Raleigh returned to England without finding the mine, and was reärrested and executed under the sentence which had never been revoked. The speech he made on the scaffold was a masterpiece of eloquence. "As he stood there in the cold morning air," says Mr. Gosse, "he foiled James and Philip at one thrust, and conquered the esteem of all posterity." He asked to see the axe, and, touching the edge, said: "This is a sharp medicine, but it is a sure cure for all diseases." His *History of the World*, written during imprisonment, was a monumental work. He was executed at London, Oct. 29, 1618.

Ralph, Julian, an American journalist, war-correspondent and author, was born in New York City in 1853. His journalistic career was very brilliant. He served in turn on the staff of the New York *Daily Graphic*, the New York *Sun*, the New York *Journal* and the London *Daily Mail*. He was present during the Greco-Turkish War in 1893 and the Boer War in 1899. He died in 1903. Mr. Ralph is the author of the following works as well as of numerous shorter contributions to magazines: *On Canada's Frontier; Our Great West; Dixie; Alone in China;* and *Towards Pretoria.*

Ram, an ironclad ship with a heavily-armored stem, projecting in the form of a beak below the water-line, intended to run into and sink an enemy's vessels. In action the ram is propelled at full speed against her antagonist, and, if she succeeds in striking her fairly, the blow is supposed to be sufficient to crush in her side and sink her immediately. The ram was first employed during the Civil War in the action at Norfolk Roads in 1862, when the Federal frigate *Cumberland* was sunk by the Confederate ram *Virginia.*

Rama (*rä'mä*), in Hindu mythology, is the name common to three incarnations of Vishnu as Parasurama, Rama-chandra and Balarama. See VISHNU.

Ramayana (*rä-mä'yȧ-nȧ*) is one of the two great epics of India, the other being *Mahábhárata.* Its subject is the story of Ráma, and its reputed author is Valmiki, who is said to have taught his poem to the two sons of Ráma. Although the statement is doubtful, it is certain that Valmiki was a real personage and that the *Rámáyana* was not, like the *Máhábhárata*, the creation of different minds at various epochs. As a poetical composition, the *Rámáyana* may safely be called the great poem of India.

Ramée, Louise de la (known by her pen-name of Ouida), English novelist of French extraction, was born at Bury St. Edmunds in 1840. Little is known of her early life or education beyond the fact that she was brought up in London, where she began in the sixties to write for Colburn's *New Monthly* and other magazines. Her pen-name was, it is said, suggested by the efforts of a child-sister to call her Louise. Her first novel, *Granville de Vigne*, appeared in book form in 1863, and she was a most industrious and prolific writer. Her novels dealt with all phases of European society, some of her themes being treated with cleverness and skill, often with cynical railing at the weaknesses of her characters. Her early stories were extravagantly romantic; but she shed her passionate exuberance and became stronger as a writer, though inclined to the reckless and tragic. She for 30 years made her home in Italy, where the scenes of many of her novels are laid. Her best-known stories are *Under Two Flags,*

Othmar, *Moths* and *Wanda*. She died on Jan. 25, 1908.

Rameses (*răm'ĕ-sēz*), Egyptian monarchs of whom two, the first and the second, were especially famous. It is usual to identify the warrior-king Rameses II with the Pharaoh who oppressed the children of Israel so sorely and Rameses III with the Pharaoh of the Exodus, although there is considerable difficulty in the identification. The mummy of Rameses II was found in 1881 and that of Rameses III in 1886.

Ramession or **Ramesseum.** The Ramession was built by Rameses the Great in the 15th century B. C. on the opposite bank of the Nile from Luxor and Karnak, and nearly as large as the former. It is the only temple entirely constructed under the reign of one king. The Ramession is in a bad state of ruin, and very little has been left even of its material; but it still is quite easy to trace the general plan. Two great pylons flank the main entrance; the two are 226 feet wide but the upper part is gone. This opens into a peristylar court which formerly had a double colonnade on two sides at least. A colossal statue, 56 feet high, of Rameses seated is at the further end facing backs of pylons. Another court, grander than the first, with porticos to left and right, each having a double range of columns, is adjoining. The entrance to this is effected through a grand doorway. Osirid figures, 31 feet high, formed a row on each side of the entrance; many still remain. Next to this is a vestibule which is reached by three flights of steps; this is ornamented by two colossal busts of Rameses and a row of columns. From this three large doorways of black granite lead to the hypostyle hall, which measures 136 feet wide and 103 feet long. Forty-eight columns support the roof, with the mode of lighting the same as that at Karnak. The ceiling is painted blue with golden stars. Beyond the hall are wide chambers, each having a roof supported by eight columns. Back of these are smaller chambers with only four columns. Around these are gathered still smaller rooms which have been suggested by some as having been used by students that came to the Ramession to study. There is supposed to have been a library here also.

Ramillies, (*rà'mē'yē'*), a village of Brabant, Belgium, is memorable as the place near which, on May 23, 1706, the French forces under Villeroy and the elector of Bavaria were defeated by Marlborough. This victory compelled the French to give up the whole of the Spanish Netherlands.

Ram'say, David, an American physician and historian, was born in Lancaster County, Pa. April 2, 1749, and, after graduating at Princeton College, studied medicine and entered upon practice at Charleston, S. C., two or three years before the Revolutionary War. After the capture of Charleston by the British he was kept as a hostage at St. Augustine for nearly a year; and at the close of the war was chosen a member of the Continental Congress. Besides medical essays and other works he published a *History of South Carolina* and a *History of the American Revolution.* Dr. Ramsay was a member of the South Carolina legislature for several years before his death, which took place at Charleston, S. C., May 8, 1815.

Ramsay, Sir William, K. C. B., F. R. S., professor of chemistry at University College, London, was born in 1852 at Glasgow, Scotland, and early distinguished himself by researches into the constituents of air while acting as professor of chemistry in University College at Bristol, of which he became principal in 1881. Six years later he was appointed to his present post, where he has with great success pursued his investigations and researches, the practical fruit of which led him in 1893, in conjunction with Lord Rayleigh, to discover the element argon and, later, the gaseous element helion. Sir William also detected in the air the heretofore unknown elements to which he has given the Greek names of neon, krypton and xenon; he has, moreover, shown the transformation of the radium emanation into helium, neon and, probably, argon and the more than likely change of copper into lithium and sodium. In 1904 Sir William was awarded the Nobel prize in chemistry. He died July 23, 1916. Besides issuing several textbooks on chemistry, Sir William has translated Beilstein's *Qualitative Analysis* and published a treatise on *The Gases of the Atmosphere.*

Ramsey (*răm'zĭ*), **Alexander,** United States senator and governor of Minnesota, was born near Harrisburg, Pa., Sept. 8, 1815, where, after studying law, he began to practise in 1839, and took part in the following year in the Harrison and Tyler campaign. In 1843 he was elected to Congress in the Whig interest; from 1849 to 1853 he was governor of Minnesota Territory; and again served Minnesota from 1859 to 1863, when it had become a state. He at one time also was mayor of St. Paul, and from 1863 to 1875 was United States senator. In 1879 he became secretary of war in the Hayes administration. He afterwards acted as a member of the Utah and other com-

ALEXANDER RAMSEY

missions. His death occurred on April 22, 1903.

Ranch'ing, the business of cattle-raising in the unsettled regions of the west. The name is derived from *rancho*, Spanish for mess or messroom. The special feature of ranching is that cattle are kept in a half-wild state, being allowed to range over a great deal of ground, such pasture as they can find being their only food. The life of ranchmen, generally called cowboys, is not so wild and free as it once was, but still has great charms for many different classes of young men. The term ranch has come to be applied throughout the west not merely to stockranges, but to all kinds of farms.

Rand, Theodore Harding, D C.L., was born at Cornwallis, Nova Scotia, on Feb. 8, 1835. Devoting his life to education, he organized the free, public schools both of Nova Scotia and of New Brunswick, and has been principal of Woodstock College and chancellor of McMaster University, in the founding of the latter of which he was largely interested.

Ran'dall, James Ryder, poet-journalist, was born in Baltimore, Md., in 1839. He was the author of numerous poems, collected in one volume in 1908, but the most famous of his compositions is *Maryland, My Maryland.* This war-poem was written in the heat of passion in the Civil War, and its success was instantaneous. Dr. Holmes wrote to Randall that he wished he might have been able to do for his own Massachusetts what Randall had done for Maryland. He died in the early part of 1908.

Randall, Samuel J., American statesman, was born at Philadelphia, Pa., Oct. 10, 1828, and, after spending a number of years in mercantile business in his native city, was elected to Congress as a Democrat in October, 1862. He held this position — being re-elected every two years — to his death, which took place at Washington, D. C., April 13, 1890. After the death of Speaker Kerr in 1876 Randall was elected to fill the unexpired term. He was also chosen speaker of the house in 1877 and 1879. Throughout his congressional career Mr. Randall's ability and integrity were conceded by men of all parties, and he was held in the highest esteem by his fellow-congressmen. He was a Democrat who upheld protection.

Ran'dolph, Edmund J., an American statesman, was born at Williamsburg, Va., Aug. 10, 1753, and after legal study was admitted to the Virginia bar. In 1776 he helped to frame the constitution of Virginia, and became its first attorney-general. He was governor from 1786 to 1788, and was a member of the convention which framed the constitution of the United States. In 1789 he entered Washington's cabinet as attorney-general, and in 1794 was appointed secretary of state to succeed Jefferson. He resigned in the following year on account of some misunderstanding with President Washington and his colleagues in reference to the Jay treaty. He died in Virginia, Sept. 13, 1813.

Randolph, John, of Roanoke, was born at Cawsons, Va., June 2, 1773. He was a second cousin of Edmund Randolph, and boasted Pocahontas, the Indian princess, among his ancestors. In 1799, though only 26, he entered Congress and continued a member, with the exception of two terms, until 1825, when he was chosen United States senator and occupied a seat for two years, during which he fought a duel with Henry Clay. In 1830 he was appointed minister to Russia, but returned home next year, and in 1832 was once more elected to Congress. Before taking his seat, however, he died of consumption at Philadelphia, June 24, 1833, having provided in his will for the freedom of his slaves, some 300 in number. During Randolph's long public career he was distinguished alike for wit, loquence and eccentricity, and was more talked and written about than any public man of his time; many of his sallies and pungent utterances are still quoted.

Randolph, Peyton, was born in Virginia in 1723, and, after studying law in London, was appointed attorney-general of Virginia by the king in 1748. He was president of the continental congress when it first met at Philadelphia in 1774, but resigned on account of ill health. He again took his seat as a member when it reassembled on the 10th of May, 1775, but died at Philadelphia in October.

Rangoon', capital of Lower Burma, is situated on Rangoon River, about 20 miles from its entrance into the Gulf of Martaban. The present city is mostly of modern construction, having been built since the English took possession in 1852. The town extends along the left bank of the river, the docks being opposite, at the suburb of Da-la on the other side. A town has existed since the 6th century B. C., but it was called Dagon till taken by Alombra, the Burmese sovereign, toward the end of the 18th century. That prince rebuilt the place, and called it Rangoon. The foreign trade of the city in 1906 exceeded 21 million rupees. Population 289,432.

Ran'jit Singh, founder of the Sikh kingdom in the Punjab of India, was born on Nov. 2, 1780, his father being a Singh chief and the head of one of the 12 military organizations of the Singhs or Sikhs. When he was six, his father died; and at an early age he began to show both a desire and capacity to rule. After the Emir of Afghanistan had given him the province of Lahore, he directed all his energies to founding a kingdom which should unite all the Singh provinces under his personal

rule. This object, after many severe conflicts, he accomplished, thus becoming the ruler of an extensive territory, with a well-trained army of 70,000 men. In 1836 his army was totally defeated by the Afghans, but this defeat did not affect his power over any of the territory he had acquired, and his long reign was not disturbed by a single revolt. He died on June 27, 1839. He could neither read nor write, yet his signal ability and energy, united with a rare moderation, are without a parallel in Asiatic history.

Ranke (*răn'kă*), **Leopold von,** one of the greatest of German historians, was born at Wiehe, about half-way between Gotha and Halle, Dec. 21, 1795. Although he studied philology and theology at Berlin and Halle, his chief thoughts were directed to history, for the study and writing of which he possessed a rare genius. His historical works, nearly 50 in number, show remarkable skill in grouping events in proper order and placing them before the reader in so clear and vivid a manner, that he can readily see them in connection with all their causes and relations. Although Ranke was over 90 when he died, he could not have accomplished what he did, had he not been a man of such great industry and application, with a marvelous memory and excellent judgment as to the value of historical material. Though his style is not brilliant, it is sufficiently clear and interesting. Perhaps the most popular of his works is his *History of the Popes*, so brilliantly reviewed by Macaulay, in the *Edinburgh Review* of September, 1840. Ranke continued to lecture in the University of Berlin until 1872, and died there on May 23, 1886.

Ran'som, Matthew Whitaker, United States senator from 1872 to 1895 and United States minister to Mexico (1895-97), was born in Warren County, N. C., Oct. 8, 1826, and educated at the University of North Carolina. In 1852 he was elected attorney-general of his state, and from 1858 to 1862 was a member of its legislature. In the Civil War he ranged himself on the southern side, and from lieutenant-colonel he rose to be major-general, and was one of those who surrendered at Appomattox. He died in 1904.

Raphael (*răf'ā-ĕl*) or **Raffaello Santi** or **Sanzio,** called by his countrymen *Il Divino* or The Divine, is ranked by universal opinion among the greatest of painters. He was born at Urbino, Italy, March 28, 1483, and after the death of his father, who was his first instructor, he was placed under Perugino (*q. v.*) the most distinguished painter of the period, who was then engaged on important works in Perugia. In 1504 Raphael visited Florence where he remained until 1508, and then went to Rome on the invitation of Pope Julius II (*q. v.*). His celebrated frescoes in the Vatican and numerous important works were then commenced. The works of Raphael are generally divided into three classes: his first style, when under the influence of Perugino's manner; his second, when he painted at Florence from 1504 to 1508; and his third style, shown in the works executed by him after he settled in Rome. Each style has its peculiar features and devoted admirers. An admirable example of the first style is the noble *Betrothal of the Virgin.* The great pictures of his second period are the Ansidei *Madonna*, the Grand-Ducal or Pitti *Madonna* and the *Madonna with the Gold-finch.* The supreme creations of his third manner are the wall-paintings in the Vatican, the Sistine *Madonna* and *The Transfiguration.* Those who incline to art employed in the service of religion prefer the first manner, as embodying purity and religious feeling. His last manner, perfected when the taste for classical art and learning was excited by the discovery of numerous works of the classic period, is held by many as correctly embodying the highest art; while his Florentine style is especially admired by some as showing his powers freed from the imitation of Perugino and as yet unaffected by the conventionalism of classic art. In each of these different styles he has left works of great excellence. He died at Rome, April 6, 1520.

RAPHAEL SANZIO

Rap'pahan'nock, a river of Virginia, rises in the Blue Ridge of the Alleghany Mountains and flows southeasterly into Chesapeake Bay, its total length being about 250 miles. The chief branch is the Rapidan; and these rivers were the scenes of desperate battles during the Civil War, the most noted being Burnside's repulse at Fredericksburg in the winter of 1862–3.

Raspberry (*răz'bĕr-rȳ*), species of *Rubus*, the bramble genus and a member of the rose family. Associated in the genus with raspberries are blackberries and dewberries. The original garden raspberries are *R. idæus*, natives of Europe, but now said to be almost out of cultivation in the United States. The parent of the black raspberries of the gardens is *R. occidentalis*, common in this country; while the parent of some of the red raspberries is *R. strigosus*, common in the United States, especially northward. Numerous garden varieties have been cultivated from these and other wild species, chiefly by hybridizing. Some wild raspber-

ries are exceedingly ornamental in cultivation, having large showy flowers, chief among which is *R. odoratus*, with purple flowers one to two inches in diameter.

Rat, a gnawing animal related to the mouse and of similar form, but larger. Like mice, rats are quick, burrowing and nocturnal in habits. The brown rat is about eight or nine inches long without the tail. It has spread over the civilized world, having originally come from western Asia. It appeared in Europe during the 18th century and has been transported by ships to other countries. It is commonly called the Norway rat, but the name is ill-advised, because Norway was not its original home. The black rat is smaller, being about six or seven inches long. Its original home is believed to have been Persia. It, likewise, by migration and transportation spread around the world, but it is less fierce than the brown rat, and is driven before the latter. The wood, trade or pack rat is one of the most interesting members of the family. Innumerable stories are told of its pranks. It is distributed generally in our southern and western states, and is also found in Mexico and British Columbia. It builds a mound-like nest of twigs, grass, leaves and bark, and does its work at night. It is a large rat, the color a yellowish-gray, with under parts and feet white, eyes and ears noticeably large, expression mild and rabbit-like. The cotton-rat of the south, a small yellowish-brown rat, is very greedy and destructive. The marsh-rat, about the size of the preceding, is a great swimmer, sometimes makes its nest among reeds, and shows close relationship to the muskrat. The kangaroo-rat, a pouched rat, is a beautiful little creature, found in the arid regions of our southwest. It is small; has a tail longer than its body, the tail being tipped with a brush and used as a rudder; a silky coat of softest brown; pointed head, long whiskers, outside cheek-pouches. With its exaggerated hind legs, its habit of hopping about thereon with the forepaws tucked up under the chin, it seems a miniature kangaroo.

Rat Portage. See KENORA.

Rat'tlesnake', a deadly-poisonous snake, with horny rattles on the tail. The rattles are horny rings made of modified scales, so loosely constructed that they rattle when the tail is vibrated. There are about fifteen species, exclusively American. These snakes have grooved fangs that are erected when they strike. There are several reserve fangs on each side to replace those that may be broken. The common rattlesnake of the eastern United States extends from Maine to Texas. It attains a length of four feet, and, exceptionally, may have as many as twenty-three rings in the rattle. The color is yellowish brown of various shades, with three rows of irregular brown blotches; the tail is black. They are naturally sluggish, and do not attack unprovoked. Their food is rabbits, rats, squirrels and other small animals. The prairie rattlesnake or massasauga is smaller and darker colored. It is common in grassy meadows where not exterminated. Several other kinds are found west of the Mississippi and in South America, some attaining a length of seven feet or more. See COPPERHEAD and MOCCASIN.

Rauhes (*row'hēs*) **Haus** (The Rough House) is an institution founded and managed by Johann Heinrich Wichern at Horn, near Hamburg, in connection with German home-missions. It partly is a refuge for neglected children; partly a boarding school for the moral and intellectual education of the children of the higher classes; and partly a training-school for those who wish to become teachers or officials in houses of correction etc. It was opened in 1831 and has since almost grown into a large community. The children live in families of twelve, each being under the superintendency of an artisan, who employs the children in indoor and outdoor labor according to their capability.

Ra'ven, a large, crow-like bird in the Old and the New World. The American raven is much larger than the crow; upper part of a glossy black with green and purple reflections, duller below; feathers of throat and breast fringe-like. It is common in the west and northwest, often seen soaring high over the evergreens. The bulky nest is built on lofty cliff or evergreen, a well-made structure of sticks with soft lining of sheep's wool and fine grasses, the same nest being used year after year, but repairs being made for each new brood. The little ones have considerable white mixed with the black. Ravens are gregarious. dwell with any birds of their genera. The birds are omnivorous. Their note is harsh except during the breeding-season; nevertheless they can be taught to imitate sounds.

Raven, The, a poem by Edgar Allan Poe, first published in *The New York Mirror* on January 29th, 1845. It is Poe's most famous work, and has been an object of study almost from the day of publication. Many stories have been told of the circumstances and manner of its composition. Poe himself has told the story, but few critics have been willing to accept his statement. There are many foreign translations, and with French students especially it is an object of great admiration and study. See POE.

Raven'na, a city of central Italy, situated in the midst of a well-watered, fertile and finely wooded plain. Ravenna is an ancient city, rich in monuments of art. It is the fifth Christian century surviving to the twentieth. Besides a library of nearly 100,000 volumes, it has an archæological museum and educational institutions. The city probably was of Umbrian origin; at least it was an Umbrian city when it passed into the

hands of the Romans. Augustus made it a firstclass seaport and naval station, and 400 years later Emperor Honorius took refuge there and made it the capital of the Roman empire. It attained its greatest glory under Theodoric the Ostrogoth, whose mausoleum is outside the walls. It contains the tomb of Galla Placidia, a Roman princess, who lived from 388 to 450 A. D., and was the daughter of Theodosius the Great. Dante died there in 1321, and his ashes remain there still. It became a republic in the early part of the 13th century, but was subject to Venice from 1440 to 1509. Then it passed into the hands of the popes and continued under their domination until 1860. Byron resided at Ravenna from June, 1819, to October, 1821. Population 64,031.

Raw'lins, John A., American soldier, was born at Galena, Ill., Feb. 13, 1831, where he was admitted to the bar and commenced the practice of law in 1855. He was appointed adjutant-general on the staff of General Grant in 1861, and with scarcely any interruption he was with Grant in all his battles, marches and campaigns, rising from captain to major-general. He died on Sept. 9, 1869.

Raw'linson, George, was born at Chadlington, Oxfordshire, in 1815, and after graduating at Oxford was elected a fellow and tutor in Exeter College. In 1860 he published his notable Bampton lectures on the *Historic Evidence for the Truth of the Christian Records*. His historical works cover nearly the entire history of the ancient orient, commencing with an edition of Herodotus, in which many of his brother's discoveries are incorporated. This was followed by *The Five Great Monarchies of the Ancient Eastern World, The Sixth Great Oriental Monarchy, The Seventh . . . Monarchy, A Manual of Ancient History* and *A History of Ancient Egypt*. He died in 1902.

Rawlinson, Sir **Henry,** K. C. B., oriental scholar and diplomat, was born at Chadlington, Oxfordshire, England, April 11, 1810. He entered the Indian military service in 1827, and served in Bombay presidency until 1833, when he was appointed to assist in reorganizing the army of the Shah of Persia. During the six years he spent in that country he began to study the cuneiform or wedge-shaped inscriptions, and made a translation of the famous Behistun inscription of Darius, which he published in the *Journal of the Asiatic Society*. He held command of Kandahar during 1840–42, and in 1844 was appointed political agent at Bagdad and consul-general in 1851. In 1858 he was sent to Persia as British minister. In 1871 he became president of the Royal Geographical Society. He died at London, March 5, 1895. He wrote *England and Russia in the East, The Cuneiform Inscriptions of Western Asia, Outline History of Assyria* etc. See CUNEIFORM.

Ray'leigh (*rā'lĭ*), **John William Strutt,** BARON, one of the most eminent of English physicists, was born on Nov. 12, 1842. He was educated at Trinity College, Cambridge, where he graduated as senior wrangler and Smith prizeman in 1865. In 1879 he succeeded Clerk-Maxwell as professor of experimental physics at the University of Cambridge, but resigned in 1884. Later he succeeded Tyndall as professor of physics at the Royal Institution in London. His profound scholarship is well illustrated by his *Theory of Sound*, which has remained a standard ever since its publication in 1877–8. His prodigious activity is illustrated by his *Scientific Papers*, published in 1901.

Ra'zor-Shell, a long bivalve-shell, shaped like a razor-case and belonging to the razor-clam. The shell gaps at each end, and from one the siphons or water-tubes of the animal protrude. This animal makes vertical burrows in the sand, two or three feet deep, and ascends and descends by means of its foot. Razor-shells are used both for food and bait.

Read, Opie, American novelist and journalist, was born at Nashville, Tenn., Dec. 22, 1852, and educated at Gallatin, Tenn. He began newspaper work at Franklin, Ky., but proceeding west made Little Rock, Ark., his home for about ten years, where he founded and edited a humorous weekly, *The Arkansaw Traveler*. He subsequently removed to Chicago, where he has published successful stories dealing with southern life. His more important novels include *A Kentucky Colonel, A Tennessee Judge, An Arkansaw Planter* and *On the Suwanee River*.

Read, Thomas Buchanan, American poet and painter, was born in Chester County, Pa., March 12, 1822, and after spending a year or two in the studio of a sculptor in Cincinnati, O., he gave his attention to painting, entering on the practice of that art in Boston at 20. In 1850 he went to Florence, Italy, where he continued to live, visiting America occasionally until his death, at New York, May 11, 1872. He won considerable fame as a portrait-painter, and took an active interest in the cause of his native land during the great Civil War, his most popular poem, *Sheridan's Ride*, being written during that conflict, which he afterwards illustrated. His *Wagoner of the Alleghanies* was written in 1862, and read publicly throughout the country by James E. Murdock for the benefit of the sanitary commission.

Reade, Charles, a distinguished English novelist, was born at Ipsden House, Oxfordshire, June 8, 1814. He received his education at Oxford, where he so distinguished himself as to secure a fellowship in 1835. It was not until 1850, however, that he commenced his career as a writer. "I," he himself tells us, "studied the great art of fiction for 15 years before I presumed to

write a line of it, writing first for the stage — about 13 dramas, which nobody would play." Apart from his numerous quarrels and lawsuits, his life after 1852 is a record of the production of plays and novels By the former he generally lost money, and by the latter secured both money and fame; for, in spite of all his peculiarities and defects, he showed himself a story-teller of rare gifts and powers. Among his novels are *Hard Cash*, *Never Too Late to Mend*, *Put Yourself in His Place* and *The Cloister and the Hearth*. He died at Shepherd's Bush, London, April 11 1884, his last years clouded by sorrow and ill-health. See *Memoir* by Compton Reade.

Read'ing is a subject of the elementary school, sometimes called reading and literature. From the standpoint of the aspects emphasized, reading sometimes is classified as beginning reading, thought-reading and appreciative reading. All three aspects of reading are present through the school course, but each is usually emphasized at a different time, about in the order given.

Beginning Reading is the title given to the process of teaching children to read for the first time. Usually it is applied to the subject in the first schoolyear, where the main difficulty of the child is in mastering the mechanics of reading, *i. e.*, associating (1) the new and strange printed forms with (2) oral words and (3) experiences already within his command. Printed words, standing for experiences the child has not had, are preferably omitted at this stage. The main effort is to get the child to recognize the visual forms which are the equivalents of the spoken words and experiences he knows. There are two general types of approach in getting the child to master the visual symbol. (I) The thought-methods teach thought-wholes, which involve teaching (a) a word (*dog*) or (b) a group of words (*to the door*) or a whole sentence (*I can run*) as a unit without attempting to break the unit into parts. The experience, the spoken words and the printed word or group of words are presented together until the child associates the three elements so perfectly that the presentation of any one will immediately recall the other two. Attention to the mechanical and phonetic structure of words is minimized or completely omitted. The main reliance is upon interesting reading matter, which gives the child a motive for associating the printed symbols. (II) The phonetic methods teach the child to get the pronunciation of printed words by getting him to master the pronunciation-units (letters, syllables or phonograms) which make words. If the child can get the sound out of a printed word, that sound will correspond to a spoken word which already means something, so that the meaning of the printed word becomes suggested. Care has to be taken here that the printed word already is within the child's vocabulary. The theory is that, when the fundamental sounds and the letters which stand for them are mastered, the child will be abie to give the sound to any word he finds. When the word does not happen to be within his experience, the meaning has to be given, else the child will be merely calling sounds which have no meaning for him. Phonetic methods are more artificial, and the first work is mechanical and barren of interest, so that repetition must to some degree be substituted for the interest lost. The main phonetic methods which have been used in this country are (a) the alphabetic (b-u̯-l-l-i-o-n), (b) phonetic-alphabetic (b-u̯-l-l-i̯-o-n), (c) syllabicating (bul'lion) and (d) phonogramic (b-ull-ion) methods. The first and the last method use no diacritical marks. The alphabetic method of reading-by-spelling-the-same was used in this country through the colonial period. It was supplemented by work with syllables (a-b, ab; b-a, ba; etc.) The prevalent phonetic methods represent a mixed use of the phonetic-alphabet and the phonogramic method.

Most teachers are abandoning diacritical marks (ā) and using a system of beginning-reading which combines the phonogram-method with the thought-method. (1) The teacher begins with a whole sentence which is of interest to the child (Can you throw the ball?). Another sentence with a varied portion is also taught (Can you catch the ball?). The meaning is made clear by acting out the sentence. Pictures, objects, conversation are also used to insure the meaning, as the case demands. (2) The difference in the meaning and appearance of the two sentences at once gives special meaning to the words "throw" and "catch." "The ball" probably is first known as a group, "the" being isolated later. (3) When each word is given its own special meaning, the phonogram or natural sound-unit is developed where the regularity of the word lends itself easily, as in "ball" (b-all). A more complex word, as "you," would not be divided but would be kept as a whole continuously. (4) The phonograms known would be reblended into new words. Knowing "c-an," "b-all and "c-atch," the child could, by sound and sight analogy, read "c-all," "b-atch", etc., thus quite rapidly extending his vocabulary. (5) These new words would be made into sentences, along with the old words, and given to the child to read so that they would give him thought. Generally speaking, an irregular word (through) or one containing a *phonogram not yet developed* for the child (l-eague) would be given to the child as a sight-word to be *learned as a whole*, if it should

appear in the course of the child's reading. The final aim is to get the child to recognize a strange word in terms of the largest familiar units in it; "milk-maid" might be seen as two words; "milk-y" as a word and a letter; "milk-er" as a word and a phonogram; "milk-i-ness" as a word, a letter and a syllable. In the actual reading of a sentence we may finally read our words in groups, as in "The boy – saw – the chair – in the house."

Thought-Reading is the title given to the reading of the primary grades beyond beginning-reading, when the bulk of the mechanics is mastered and the main effort of the teacher is to get the children to read silently, rapidly and accurately for the purpose of getting the thought of the printed page.

Appreciative Reading is the title given to the reading of classic literature, mainly in the grammar grades. The mechanics have been well-mastered long since, and the child has little difficulty in getting just the intellectual meaning of the page, and now reads aloud to get an appreciation for the feeling of the poetry or prose.

Special Reading Methods. There are many special ways of having the child read and these special methods are given various titles. Among the most important are the following: (a) *Oral Reading*, reading aloud, used to check accuracy of pronunciation and expression of thought and feeling; (b) *Silent Reading*, used to increase speed, and representing the usual way of reading in ordinary life; (c) *Individual Reading*, the main method of the school; (d) *Concert-Reading;* the entire class reading aloud, used for drilling on sound, otherwise not frequently used; (e) *Prepared Reading*, where the child has studied the material in advance of his school rendition; (f) *Sight-Reading*, reading without previous preparation to test and give power to read new matter instantly; (g) *Intensive Reading*, where the child reads a single text, mastering every difficulty as he meets it with thoroughness; (h) *Extensive Reading*, where the child reads many books depending upon interesting matter and context to get the meanings of new words and phrases; (i) *Supplementary Reading;* reading from many texts which are additional to the main text. Such supplemental texts include history, nature, geographical and other readers with varied subject-matter.

HENRY SUZZALLO.

Reading (*red'ing*), **Pa.**, a city, county-seat of Berks County, on the left bank of the Schuylkill, 60 miles from Philadelphia. It is pleasantly situated on an ascending plain, and draws its water-supply from the neighboring hills. The principal manufactures are iron and steel works, which include many rolling mills, forges, foundries, furnaces etc., but its railroads and machine shops, potteries, hosiery and knitting mills, hat-factories, paper and woodpulp mills are important. Among the educational institutions, beside public schools, are Reading Classical School, Reading Academy and Business College, Schuylkill Seminary and Mount Saint Michel's Academy. Reading has an admirable system of parks, fine churches and the service of the Pennsylvania and Reading railroads. Many of the inhabitants are of German descent, and half the newspapers are published in that language. Population 96,071.

Reap'ing-Machines have developed far from the original reaping-hook or sickle, which was used among the ancient Jews, Egyptians and Chinese. Roman Pliny in 23 A. D. spoke of a reaping-machine used by the Gauls, which in fact was a cart with projecting teeth, in which the ears were caught, and then plucked by hand. This cart was pushed from behind by an ox. But Ogle's machine, invented in 1822, was the first reaping-machine which at all resembled the modern type. Another fairly successful attempt was Bell's machine of 1827. These machines were English. American reaping-machines date from 1803; and have developed much more efficiently than the English types. (See MCCORMICK, CYRUS). By 1850 very efficient reaping-machines had been constructed. They possessed a cutter with either straight or serrated edge, working over a platform upon which the grain might fall; and they were drawn from the side by horses. The combination of binding with reaping began after 1850. Some reaping-machines are now adapted so that they thresh the grain and feed it into bags at the same time that they are cutting off the heads. Such machines have had much to do with the success of large farmers, who can compete by means of their machinery to advantage with the smaller landholders. Lawn-mowers are a kind of side development from the agricultural reaping-machines. Even vegetables, such as peas, are now often harvested by machinery. The ordinary reaper and binder for wheat cuts the grain, ties it in neat sheaves, and throws off these sheaves in bundles of eight or ten, ready for carting to the barn.

The industrial and economic effects of the reaper can not be overstated. It has been said that in the American Civil War it did the work of 1,000,000 men in the northern states, releasing 350,000 men for military service. Stanton in 1861 stated that to the north it was what the slave was to the south. Seward averred that "the reaper pushed the American frontier westward 30 miles a year." President Hughitt of the Chicago and Northwestern Railway declares that "the reaper has not yet received proper recognition for its develop-

ment of the west." Yet even its work in the United States is not all. It is used in 50 other countries, as Algeria, Argentina, Australia, Canada, Cape Colony, China, India, Russia and Siberia, and "its click has become the music of an international anthem." A single Russian province uses 37,000 American harvesters. The American reapers in use in Europe in 1907 did the work of 11,000,000 men. The reaping of wheat costs less than a cent a bushel. Next to Russia, among foreign countries, in the use of the reaper comes Canada, Argentina ranking third.

The industry has attained enormous proportions. One company makes over 700,000 harvesting machines of all varieties each year. In 1911 it sold $108,000,000 worth. In 1909 American farm machines worth $146,326,000 were made. The harvester has to be adapted to the particular conditions of farming in different countries and to the peculiar customs of their farmers. Harvesters must be adapted to big horses in France, camels in Siberia, oxen in India and small horses in Russia; to thecareful German of Wisconsin and to the rough ranchers of Argentina. Consult Casson's *Romance of the Reaper.*

Réaumur (*rā'ō'mūr'*), **René Antoine Ferchault de,** a prominent man of science in France during the first half of the 18th century, was born in 1683, and died in 1757. He is principally remembered as having devised the thermometric scale which goes by his name, namely, that in which the temperature interval between melting ice and boiling water is divided into 80 degrees. See Celsius, Fahrenheit and Thermometer.

Récamier (*rā'ka'myā'*), **Jean Françoise Julie Adelaide Bernard,** was born at Lyons, Dec. 4, 1777. She grew up a girl of remarkable grace and beauty, and at 15 married Jacques Récamier, a rich banker of Paris, three times as old as herself, and immediately entered upon a career of social triumph almost without a parallel even in France. Her *salon* was soon filled with the brightest wits of the literary and political circles of the day, and, fortunately for herself, she was possessed of a temperament that saved her from temptation and almost from scandal. She had a warm affection for Madame de Staël. When the latter was banished by Napoleon, Madame Récamier did not fail to give the exile her warmest friendship and sympathy. In 1806 the ruin of her husband's fortune caused her to visit Mme. de Staël at Coppet, in Switzerland, and while there she met Prince August of Prussia, who is said to have been the only one of all her admirers that ever touched her heart. A marriage was arranged between them, provided a divorce could be secured. Récamier gave consent, but his mild remonstrance so affected the wife that she declared she could not leave him in his adversity. Madame Récamier died at Paris of cholera, a disease of which she always had a special dread, May 11, 1849.

Recep'tacle (in plants), that part of a stem-axis upon which the floral organs are inserted. Usually the receptacle becomes much broader or more prominent in some way than the ordinary axis. Torus is an equivalent word. See Flower.

Rechabites, The, a family descended from Hammath, the progenitor of the house of Rechab; otherwise known as the Kenites (*I Chron. ii:55*). It is recorded in *Jeremiah* (*Jer. xxxv*) that the prophet took some Rechabites into the temple and offered them wine to drink and that they declined on the ground that Jhonadab, son of Rechab, their ancestor, had commanded them not to drink wine or other strong drink, to live in houses or to sow seeds or plant vineyards, and had enjoined them to dwell in tents all their days. It appears from other passages in The Bible that the Rechabites were a people who endeavored to resist the customs of settled life in Palestine by maintaining a nomadic ideal; that they existed at different times in the northern and southern kingdoms; and that they were especially interested in the worship of Yhwh [Yahweh or Jehovah]. Their devotion to Yhwh is illustrated by the fact that all known names of individual Rechabites include the divine name. In modern times such societies as total abstinence societies, which observe some of the customs, style themselves Rechabites.

Reciprocity (*rĕs'i-prŏs'i-tў*), an arrangement between two countries charging tariff-duties against other countries, to admit such articles as may be agreed upon into each other's ports free from duty. When the McKinley tariff-law of the United States was passed in 1890, a provision giving the president discretionary power to enter into reciprocity treaties or arrangements with other nations was made one of its leading features.

Rec'lama'tion of Swamp-Lands. The available agricultural lands of the United States are, for the most part, occupied. With a rapidly growing population and increasing demand for agricultural products, the need of additional farm-land has forced itself on the attention of the public and of the national government. This has resulted in the vast undertakings of the government in the reclamation of arid lands by irrigation. (See Irrigation). More recently the reclamation of swamp-lands has claimed attention. The area which has been brought under cultivation by irrigation approximates 8,000,000 acres, and it is thought probable that 12,000,000 acres additional may be reclaimed within the next 25 years. Investigation shows that there are over

60,000,000 acres of swamp and overflowed lands in the United States. It is estimated that already as large an area of lands of this character has been reclaimed by drainage mostly by the effort of individuals, drainage-associations and states' action, as that secured by irrigation, and that the reclamation of a much larger area is practicable if the work be undertaken by the Federal government. It is well-known that swamp-lands which have been successfully reclaimed have become the richest of agricultural lands. If it were possible to reclaim by drainage 25,000,000 acres of these swamps, the land-values of the country would be increased by more than $2,500,000,000. If subdivided into 40-acre farms, these swamps would supply 1,250,000 families with homes.

SWAMP-AREAS IN UNITED STATES

The black indicates swamp-areas. The ruled portion indicates areas interspersed with swamps

Many drainage works of minor importance have been undertaken by individuals, corporations, districts and states, and the work of the government thus far has been chiefly in aid of such enterprises. In Louisiana much important work has been done in the neighborhood of New Orleans; in Florida near the Everglades; in Minnesota and North Dakota in the upper valley of Red River; in Indiana in the Kankakee Marshes; and in California in the lower Sacramento Valley. The people of Illinois, of lower Minnesota and of other portions of the country have built ditches and drained considerable areas of lands which now are under cultivation. The complications, however, resulting from any attempts on the part of private parties or of counties or states, arising from conflicting rights and benefits, together with the enormous expense which must be incurred, have prevented the undertaking of large projects. This work can be done only by the Federal government, and the subject has secured the attention and the consideration of Congress, a Federal Drainage Bill having been favorably reported. A large amount of preliminary work has already been accomplished in the preparation of topographic maps which give a vast amount of important information concerning slopes and drainage of the surface of the land, and show where the swamps occur, their relation both in distance and position to natural drainage-channels and also the altitude of the swamps as referred to the drainage channels. The Secretary of Agriculture in his last report says: "Attention has been given to the possibilities of drainage in the delta-region of the lower Mississippi Valley. The completeness of the levee system is now rendering safe the expenditure of large sums for the improvement of the low, flat lands formerly subject to overflow by the Mississippi floods. The problem of the reclamation of swamp tide-lands along the Atlantic coast has received special attention during the last year. The Everglades of Florida, Dismal Swamp in Virginia, the Kankakee

Valley in Indiana and the Red River Valley in North Dakota have each been subject of survey and study."

The map here given shows the principal areas of swamp-lands in the United States.

Réclus (*rā-klü'*), **Jean Jacques Élisée.** In 1830, a whole decade before Humboldt published *Cosmos*, his successor in the science of geography was born in a Protestant parsonage in the village of Ste. Foy-la-Grande, near Bordeaux, France. Having no money to gratify his taste for travel, Réclus was forced to find wonders at home. So he questioned his native bogs, moors and streams as to their world-old adventures and dug for the answers. He had two years at school in Berlin, which he spent in studying the natural sciences and in learning how to test physical phenomena. Returning home, he got into politics and into trouble and, fortunately for the world, was sent into exile by Napoleon III. Falling in with California goldseekers, he crossed our unexplored region of plains and mountains, and went back to publish a classical description of it that made him famous in science and literature and decided his life-work. He was past 40, and again in exile for meddling in politics, when he wrote *La Terre* (The Earth). This was followed by *The Ocean*. Monumental works in themselves, these volumes became merely introductory to his *Géographie Universelle* (21 volumes, 21,000 pages) that has been translated into every modern language. It was his life-work, occupying him from the age of 40 to 66. The work differs from most scientific treatises. To the profoundest knowledge and exactness Réclus brought the imagination of a poet, the literary style of a Ruskin. Many, indeed, most of the laws governing natural phenomena, were determined before Réclus, but he brought them all together and unified all. He summed them all up in this image of the earth on which we live: "A grain of dust in the fathomless abyss of creation, ever actuated by ceaseless motion, describing in ether a series of elliptical spirals, whirling with the velocity of a cannon-ball, shooting forward with the swiftness of light and rocking back and forth in its headlong flight—as if to salute the stars in passing."

Absolutely scientific in its last analysis, only a poet could so transform dry facts. This great work, so plain, as easy to understand as a book of travels, as fascinating as a collection of romances, should be among the first to be purchased by any library, however small. Réclus died at Brussels on July 4, 1905. No biography of him has, as yet, appeared in translation.

Re'construc'tion in the South. The period known in the United States as Reconstruction followed hard after the Civil War, when it was necessary for the southern states to resume their place in the Union; and in seeking a solution of this problem the president and Congress soon were widely at variance. President Johnson adopted the theory that these states had never lost their position in the Union; and that, upon a renewal of their obligations to the Federal constitution and the laws of Congress, they were entitled to immediate restoration to their former relations as members of the Union. He accordingly proceeded to establish provisional governments in the seceded states, and by proclamation set forth the terms upon which these states would be recognized by him as members of the Union. One of these requirements was the ratification by each state of the thirteenth amendment to the Federal constitution, which had been adopted by Congress in February of 1865 and abolished slavery throughout the Union. The people of the seceded states proceeded to comply with the president's requirements. They held conventions, ratified the thirteenth amendment, framed new constitutions, and elected senators and representatives to Congress. But Congress, when it assembled in December, repudiated the restoration policy of the president. It was held by a large majority that the work of reconstruction properly belonged, not to the president, but to Congress; that the seceded states had lost their rights as members of the Union; and that they should be re-admitted only on such conditions as would secure and perpetuate the results of the war. Meanwhile the thirteenth amendment to the constitution had been ratified by the requisite number of states, and had been officially declared to be a part of the constitution of the United States. Congress now proceeded to confer citizenship upon the freedmen of the south. The Civil Rights Bill was passed over the veto of the president. The fourteenth amendment to the constitution, which included this and some other provisions, was also adopted and submitted to the states for ratification. It was ratified by Tennessee in 1866, and that state was re-admitted by Congress into the Union. The other southern states rejected the amendment. At length, in March, 1867, the reconstruction act of Congress was passed over the veto of the president. This act defined the conditions on which the southern states might be re-admitted, one of which was the ratification o the fourteenth amendment, and placed these states under military governors until these conditions should be complied with. In June and July of 1868 Arkansas, Alabama, Georgia, Florida, Louisiana, North Carolina and South Carolina, having ratified the amendment and organized state governments under the provisions of the reconstruction act, were admitted into the Union.

The fourteenth amendment, having been ratified by the requisite number of states, was officially declared a part of the constitution on July 28, 1868 The fifteenth amendment to the constitution of the United States was adopted by Congress in February of 1869, and was submitted to the states for ratification. It provided that "the right of the citizens of the United States to vote shall not be abridged by the United States or any state on account of race, color or previous condition of servitude." Virginia, Mississippi, Texas, and Georgia, which had delayed action required, were re-admitted in 1870.

During all this period affairs in the south were far from peaceful. The slaves of yesterday were now citizens and voters. In their utter ignorance they often became the tools of corrupt and designing men. Many of these, known as carpet-baggers, came from the north and took advantage of the situation to further their own selfish interests. To the whites of the south conditions were intolerable; resistance was inevitable and often took the form of acts of violence. The state authorities could maintain themselves only by invoking the aid of the general government. But the interference of the Federal government in state affairs has ever been viewed with distrust. At length a better feeling prevailed. The leaders of the south asserted that if left alone they would carry out in good faith the provisions of the constitution and laws of Congress. The disabilities of the ex-Confederates were removed by Congress in 1872, and finally President Hayes in 1877 withdrew the Federal troops from the southern capitals and announced the policy of Federal noninterference in state affairs. This may be regarded as the close of the reconstruction period. See CARPET-BAGGERS.

Red'breast, a bird belonging to the family of the Old World warblers. It is well-known in the British Isles, and is called robin-redbreast; but, it should be noted, this is not the American robin, which is a thrush. It is about 5¾ inches long, olive brown above, with the throat and upper breast a reddish orange. The abdomen is dull white. It occurs solitary or in pairs, and rears two or three broods a season near the ground, building a nest of dry leaves, moss, grass, hair and feathers. The eggs, usually five in number, are grayish-white speckled with rusty red. The English robin-redbreast is quite a sociable bird; it dwells close to the haunts of man and is fond of household dainties. Its song is sweet and plaintive.

Red-Cross Societies, a federation of relief societies in the different countries acting under the Geneva convention. The original aim of the societies was to ameliorate the condition of the sick and wounded in time of war. They had their origin in an agitation begun by Jean Dunant, a philanthropic citizen of Geneva, who in 1862 published an account of the suffering he had seen on the battle-field of Solferino, June 24th, 1859. He attributed much of the suffering to the lack of provision for the proper care of the sick and wounded and suggested that societies be formed in the different countries to collect supplies and train nurses etc., in times of peace to co-operate with and assist the regular surgical corps in time of war. The Society of Public Utility in Geneva took up the suggestion. In the following year an international conference was held in Geneva, at which sixteen nations were represented. A provisional program was agreed upon and in August, 1864, a more formal, diplomatic congress of representatives from the same nations was held, at which was signed what is now known as the Geneva convention. A red cross upon a white field was adopted by the congress as the exclusive badge of all societies formed in accordance with the principles of the convention. The first international conference of Red Cross societies was held in Paris in 1867. Red Cross societies were first formed in the United States in 1881, and the Geneva Convention was first ratified by the United States government in 1882. Miss Clara Barton, President of the Red Cross societies in the United States, suggested that they be prepared to render relief to the suffering in times of great calamities, as fires, floods, famine, pestilence etc. as well as in times of war, and her suggestion received the unanimous sanction of the National and International Committees. The Hague peace-conferenoe in 1899 ratified the proposal of 1867 that the provisions of the societies be extended to naval warfare. While international conferences of the Red Cross societies have been held and the Society at Geneva serves as a Central Committee by which an international bulletin is published and through which all international communications are made, the societies are not really international. They are national and independent, each governing itself and making its own laws according to the genius of its nationality and needs. All societies throughout the world have a common badge and a common aim, and sustain mutual relations to the convention. The American society has furnished relief amounting to several millions of dollars besides inestimable personal service. The society, in its own vaults, always accessible, night and day, keeps funds sufficient for any sudden emergency.

Red Jack'et, a chief of the Seneca Indians was born near Seneca Lake, N. Y. in 1752, his original name being Sagoyewatha and the name of Red Jacket being given to him on account of a scarlet jacket presented to him by a British officer during the Revolutionary War. He was an active ally of the

British in that contest; but in the War of 1812 he rendered valuable service to the United States in the operations on the Canadian frontier. During his last years he lost much of his prestige and influence by his intemperate habits. He died on Seneca Reservation, near Buffalo, in 1830.

Red'lands, Cal., a city sixty miles from Los Angeles, in San Bernardino County. It is at the base of San Bernardino Mountains in a famously beautiful and fertile region. Fire-clay exists in this section, and the oranges are especially fine. Other fruits, barley and wheat are grown, and the important trade consists chiefly of raisins, oranges, lumber, building-stone and fire-clay products. Redlands has an admirable school-system, a library, all modern improvements and the service of two railroads. Population 10,449.

Red Riv'er, the lowest western branch of the Mississippi, rises in the northern part of Texas, near the New Mexico border, and flows eastward as the boundary line between Texas and Oklahoma, thence southeast through Arkansas and Louisiana, entering the Mississippi a little over 300 miles from its mouth. It receives its name from the color of the sediment with which it is loaded during high water. Its total length, on account of its winding course, is 1,500 miles; and it receives numerous branches, the Washita, the Negro and the Little Wichita being the most important. It is navigable during seven or eight months of the year to Shreveport, La., 300 miles from its mouth.

Red River of the North rises in a cluster of lakes in western Minnesota and flows northward, separating Minnesota from North Dakota, into Manitoba, and emptying into Lake Winnipeg, about 600 miles from its source.

Red River Rebel'lion. Upon the extinguishment of the claims of the Hudson Bay company and the taking over of the Northwest Territories in 1870, the 12,000 inhabitants of the Red River settlement found themselves ignored Of the several factions, the whites, 2 000 strong, and the half-breeds of Scotch and Indian origin, found themselves overruled by the *Métis* or French half-breeds, with the assistance of the Fenians who had already made trouble and a number of American immigrants bent on annexation. Louis Riel, upon the coming of William McDougall, the lieutenant-governor, seized Fort Garry in October 1869, and had McDougall turned back at the frontier. Forming a provisional government, Riel had a young man shot for treason against his rule, and this murder set the country aflame. Of the thousands volunteering for suppression of the revolt, 700 were accepted, and these with 500 regulars, the whole under the command of Colonel Garnet Wolseley, formed the Red River Expeditionary Force. Before they could reach Fort Garry in August, 1870, after toiling through the wilderness, Archbishop Taché, acting as pacificator, succeeded in inducing the rebels to lay down their arms, and the little army found no opposition, the leaders having fled across the border. (See RIEL, LOUIS.

Red Sea or **Arabian Gulf** is an inlet of the Indian Ocean, stretching northwest from the Strait of Bab-el-Mandeb (by which it communicates with the Gulf of Aden) to the Isthmus of Suez, by which it is separated from the Mediterranean Its length is from about 20 miles next the Strait of Bab-el-Mandeb to about 200 miles in the central portion, the northern portion being divided by the Sinai Peninsula into the Gulf of Suez and the Gulf of Akabah. The former is 180 miles in length and from 10 to 15 in breadth. From the earliest times the Red Sea has been a great highway of commerce between India and the countries bordering on the Mediterranean, being traversed successively by Egyptians, Phœnicians, Hebrews and Arabs. It is first mentioned in *Exodus* on the occasion of the passage of the Israelites, which is supposed to have taken place a little south of the present town of Suez. The discovery of the route around the Cape of Good Hope turned the traffic with India into a different channel; but since the opening of Suez Canal in 1870 the Red Sea has more than regained its former importance as the highway of commerce between Europe and the east.

Red'start, a small bird common in the United States and, also, a similar bird common in Europe but belonging to a different family. The European redstart belongs to the family of Old-World warblers. It is slightly smaller than the American bird, being about five and one quarter inches long. It is dark-gray, with black throat, white forehead and rusty-red breast, sides and tail. In some parts of England it is called the fire-tail. The American redstart belongs to the family of New-World warblers. It is about five and one half inches long, its general plumage a glossy black with salmon or orange-red on wings and tail, breast and lower part white. This bird is seldom seen on the ground; it perches on trees from which it is continually flitting to catch insects on the wing, and gleams in and out among the greenery like a bit of fire. It migrates early in May and in September, is found as far west as the Pacific coast and north to upper Canada. Its note is sweet

REDSTART

and oft-repeated. Its nest is a trim, cup-shaped affair of thin strips of bark, fine grass, vegetable fiber and plant-down. The three to five whitish eggs are blotched with brown and lilac.

Reed, in music, the mouthpiece of a hautboy, bassoon or clarionet. It also is a piece of metal with a brass spring or tongue so attached to it that the admission of a current of wind causes it to vibrate and produce a musical note. The reed is of two kinds: the *beating* reed and the *free* reed. The former is used in the pipes of an organ, and must be placed within a tube to produce a musical sound. The invention of the free reed has been ascribed to Grenié, a Frenchman, who brought it into use, but it had long been known to the Chinese. Its note is smoother and mellower than that of the beating reed, and it has the advantage of not requiring a pipe, which is a necessary appendage to the latter.

Reed, Thomas B., American politician, was born at Portland, Me., Oct. 18, 1839, and graduated from Bowdoin College in 1860. After serving a short time as assistant paymaster in the navy, he studied law and commenced legal practice in 1865. After serving successively as a member of the Maine legislature, as attorney-general of the state and as city solicitor of Portland, he was elected a representative in the 45th Congress in 1876. His commanding ability was so clearly recognized that he soon became the acknowledged leader of the Republican party on the floor; and, when his party secured a majority of the house of representatives in the 51st Congress, Mr. Reed was chosen speaker. He served continually in Congress until 1899, and was elected speaker of the 54th and 55th Congresses. He was re-elected in 1899, but resigned his seat and took up the practice of law in New York City. He published *Reed's Rules* in 1894, and edited *Modern Eloquence*. He died on Dec. 7, 1902.

THOMAS B. REED

Reeves, John Sims, one of England's greatest singers, was born at Shooter's Hill, Kent, Oct. 21, 1822. At fourteen he was deemed a skillful performer on various instruments, and was appointed organist and director of the choir. He went to Paris in 1843 to perfect his voice and style, and on his return to England in 1847 he was recognized as its first tenor, a position which he maintained for years, his voice being one of wide range and of great natural sweetness and purity. He died at Worthing, Sussex, Oct. 25, 1900.

Refin'ing.

Kerosene-Refining. Crude petroleum, commonly called oil, is refined into purer oils for lubrication and illumination. The method of refining is a process essentially of gradual distillation. The crude oil is conducted into iron vessels fitted with a dome from which a vapor-pipe leads to a condenser. The oil is then gradually heated until one constituent after another is given off as vapor. The principle of refining is that each oil has its own volatile temperature, so that one kind of oil may be conducted by the vapor-tube to its own tank and then condensed and collected and shut off, before another kind begins to evaporate. Naturally this simple method of distillation, where there are so many substances present as in petroleum, does not yield perfectly pure products. The first gases to be given off from the petroleum are various forms of naphtha. A second still is generally used for the distillation of benzine and the heavier oils, which are chiefly used for illumination and lubrication. The naphtha constituents of petroleum pass off in the following order: cymogene, rhigolene, petroleum, ether, gasoline and benzine. The residuum is then filtered, and a further separation of oils is effected by the filtration, as the lighter oils come through the bone-black or fullers' earth more rapidly than do the heavier. Most of the lubricating oils are obtained in this process. The oils are tested with regard to color and specific gravity. It is important, however, that such oils as kerosene, which are in wide demand for illumination, should not be too inflammable; and therefore they are tested that their flashing-point may not be lower than 110° F. nor their burning-point lower than 125° F. Machine-oils are tested for coldness, as they must not thicken too readily.

Sugar-Refining. The refining of sugar is largely by filtration and evaporation. The raw sugars made from beet, cane etc. differ greatly in their constituents, the beet containing alkalines and the cane ethers and oils The refining process makes the sugars practically identical, except in the lower grades. The raw sugar is dissolved in a thirty per cent. solution, filtered through bags, often treated with lime, and then filtered as in the case of petroleum over bone-black. By this process the sugar is bleached. The almost white solution that results is then boiled and the size and hardness of the crystals may be regulated by the higher or lower vacuum, the lower vacuum producing the harder crystals. The crystals are dried in centrifugal dryers. The first granulation gives the highest grade of sugar; lower granulations give lower grades.

Ref'orma'tion, the great religious revolution of the 16th century. With the Refor-

mation began what is known as *Modern Europe*, while the epoch that preceded it bears the equally distinctive name of *Middle Ages*. From 800, when Charlemagne was crowned emperor of the Romans by Pope Leo III, western Europe had been under complete subjection to the church, and many abuses has arisen. The revival of learning and the discovery of the New World had also awakened a spirit of independence in men's minds. It only required a spark to kindle the slumbering agitation into a definite flame. This was supplied by the sale of indulgences under Pope Leo X. Once started, the Reformation made such rapid progress that the national churches of Britain, Sweden, Norway, Holland and many parts of Germany and Switzerland separated from Rome, while in other countries, as Hungary and France, the same movement detached large portions of the people from the Roman faith, without separating the church itself from the papacy. By the middle of the 16th century it seemed as if the revolution would carry everything before it. At the beginning of the Reformation the authorities of the Roman church did not realize the extent of the danger which threatened it, regarding the movement merely one of the many discussions and schisms to which the church had always been more or less subject; but when they saw the revolt spreading into country after country and taking so firm a hold on the minds both of rulers and people, their eyes were opened and they proceeded to the repair of the breaches that had been made with all the zeal and energy of which they were capable. The Society of Jesus, founded by Ignatius Loyola in 1540, supplied an army of enthusiasts whose policy and devotion saved Rome from dissolution. By the decrees of the Council of Trent (1547–63) the church reaffirmed its ancient doctrines and traditions; and a succession of popes during the latter half of the 16th century carried out with zeal the policy marked out for them by the Jesuits. To quote the language of Lord Macaulay: "Two reformations were pushed on at once with equal energy and effect — a reformation of doctrine in the north and a reformation of manners and discipline in the south. . . . In the Order of Jesus was concentrated the quintessence of the Catholic spirit; and the history of the Order of Jesus is the history of the great Catholic reaction." Thus the middle of the 16th century saw the tide of the revolution checked; and by the close of the century Europe was divided between the two forms of Christianity by almost the same lines as exist at the present day. To quote again from Macaulay: "As Protestantism had driven Catholicism to the Alps and Pyrenees, so Catholicism rallied and drove back Protestantism, even to the German Ocean; nor has Protestantism in the course of 200 years been able to reconquer any portion of what was then lost." See CALVIN, HUSS, LEO X, LUTHER and WICLIF. Consult Seebohm's *Era of the Protestant Revolution*.

Refrig'era'tion is the art of producing cold by artificial means. The operation of cooling substances by some mechanical device has been practiced since very ancient times, but only in comparatively recent years have these devices been such as to enable the operation to be conducted profitably and on a commercial scale. Natural ice has always been a great source of refrigeration. In tropical countries such simple devices as porous jars placed in a draught have long been used for cooling the water with which the jars were filled. But in the highly developed civilization of recent times, with millions of people concentrated in cities sometimes hundred of miles from the sources of the food-stuffs desired, a limited supply of natural ice and simple refrigerating devices have not been sufficient, and necessity has given rise to many very elaborate and practical machines and refrigerating purposes. They are used for cold-storage warehouses, in which are stored for a time meats, fruits, vegetables and other perishable foodstuffs; for making artificial ice; on board ships; and for a large variety of manufacturing establishments. The various processes may be classed as (1) liquefaction, (2) vacuum, (3) compression, (4) absorption and (5) cold air. The third and fourth processes are used in the larger systems, while the others, especially the vacuum and cold-air processes, are used in smaller installations, as, for example, in domestic icemaking and on shipboard. Refrigeration by machinery has a great advantage over refrigeration by means of natural ice for use in storage-warehouses, in that the temperature can be better regulated and often the required temperature can be kept at a less cost. Artificial ice has an advantage over natural ice in that it can be made hygienically pure by first sterilizing the water.

Regillus (*rē-jĭl'ŭs*), anciently a lake in Latium, southeast of Rome, probably in the extinct volcanic crater of Corunfelle, which was drained in the 17th century. It is celebrated in the semilegendary history of Rome as the scene of a great battle in 496 B. C. between the Romans and the Latins, in which the Latins were totally defeated.

Regi'na, the capital and seat of government for the Northwest Territories, is the distributing point as well for a large area north and south. It is 1,885 feet above sea-level. Population about 3,000.

Regnault (*rĕ-nyō'*), **Henri Victor**, a French chemist and physicist distinguished especially for accurate measurements of a large number of physical constants. He was born on July 21, 1811, at Aix-la-Chapelle, and died at Paris, Jan. 19, 1878. He was educated at the Polytechnic School and at the School of Mines in Paris. After a few

years of teaching chemistry at Lyons, he was called (1840) to the Polytechnic School as professor of chemistry, a position which he resigned a year later to accept the chair of physics at the Collège de France. It was here that he carried on his magnificent series of determinations of specific heat of various elements and compounds, and of the coefficient of expansion of various gases and liquids.

Regulus (*rĕg'ū-lŭs*), **Marcus Atilius,** a distinguished Roman, who was counsel for the first time in 267 B. C. Chosen consul a second time, in 256 B. C., he was sent in connection with his colleague at the head of 330 ships against the Carthaginians, whom he totally defeated off Heraclea Minor. The Romans then landed at Clypea, and for some time Regulus was victorious in every encounter, but at last he suffered defeat and was taken prisoner. He was kept in captivity for years, but when fresh reverses caused the Carthaginians to sue for peace they sent Regulus to Rome, on parole, in company with their own envoys. It is related that when Regulus came before the Roman senate he urged that body to reject all the proposals of the Carthaginians, even to an exchange of prisoners, but to prosecute the war against that country with the utmost vigor until it was utterly subdued. After persuading the senate to adopt this course, Regulus refused to break his parole, and, without even waiting to see his family, returned to Carthage, where he was put to death (? 250 B. C.) with the most terrible torture.

Reichs'an'stalt, the great national physical laboratory of Germany, established in 1888 and situated at Charlottenburg, a suburb of Berlin. The object of this institution is twofold. Its first aim is to carry out investigation of a purely scientific character; such problems, for instance, as the change of density in water which accompanies a change of temperature, the laws of radiation etc. Its second aim is to act as a standardizing bureau, to which makers can send thermometers, resistance-coils, standard cells etc. to be tested and certified. The two functions are performed in different buildings. The first president of the *Reichsanstalt* and the controlling spirit in establishing it was Helmholtz, who conducted affairs from 1888 until his death in 1894. Kohlrausch succeeded him.

Reid, Thomas, an eminent Scottish philosopher, was born on April 26, 1710, at Strachan, a country parish in Kincardine, where his father was minister. He took his degree of M.A at Aberdeen College in 1726, and continued to act as librarian there for a number of years. In 1737 he was appointed minister to the parish church of New Machar, at which he labored with zeal and success until 1752, when he was appointed one of the professors of philosophy in King's College, Aberdeen. In 1763 he was chosen to succeed Adam Smith as professor of moral philosophy in the University of Glasgow, and henceforth devoted himself to mental and metaphysical speculation. In 1764 he published his *Inquiry into the Human Mind;* in 1785 his *Philosophy of the Intellectual Powers;* and in 1788 his *Active Powers of the Human Mind.* These treatises must always be looked upon as constituting the first complete and systematic work on the constitution of the human mind. He died at Glasgow, Oct. 7, 1796. See his *Life* by Dugald Stewart and McCosh's *Scottish Philosophy.*

Reid, Whitelaw, editor and diplomat, was born near Xenia, O., Oct. 27, 1837, and graduated at Miami University, Oxford, O., in 1856, soon after which he commenced his literary and journalistic career by becoming editor and proprietor of the Xenia *News.* When the Civil War broke out, Mr. Reid accepted a position on the staff of the Cincinnati *Gazette,* and as its war-correspondent won a national reputation by his remarkable clearness of description and accuracy of statement. In 1868 Mr. Reid accepted a position on the staff of the New York *Tribune,* then edited by the famous Horace Greeley; and, when Greeley resigned in 1872, Mr. Reid was chosen to fill his place. When Benjamin Harrison became president in 1889, Mr. Reid was appointed United States minister to France, and during the two years he held that office discharged its functions in such a manner as to reflect high honor upon himself. In 1897 he was special ambassador of the United States to England on the occasion of the jubilee of Queen Victoria, and again at the coronation of Edward VII in 1902. He was appointed ambassador to the Court of Saint James in 1905. He published *A Continental Union* and *Problems of Expansion.* He died Dec. 15, 1912.

Rein'deer or **Car'ibou,** a kind of deer found in the northern parts of Europe, Asia and America. It can be distinguished from all its allies by the fact that both sexes have antlers. These are very large in comparison with the size of the animal, which is heavily built, with short limbs. The antlers have a browtine extending forward. In the American form the browtine of one side is aborted and the other is largely developed. The antlers, as well

REINDEER

as the hoofs, are used in removing snow from their food, which, in the winter, is a lichen called reindeer-moss. Reindeer yield good milk, and supply material for clothing, and in cold countries fill the place of horse, cow, goat and sheep. They are able to draw about 300 pounds, over the frozen snow, at nine or ten miles an hour. In much of Lapland and Siberia the land would be practically uninhabitable without them. They have long been domesticated in Lapland and Scandinavia. Some time ago the United States established stations in Alaska to promote the propagation of the reindeer and instruct the natives in their care and breeding; in 1889 the first small herd was brought from Siberia for the experiment; thereafter for several years herds were annually imported. See DEER.

Reinecke (*rī'nĕk-ĕ*), **Karl,** distinguished German composer, conductor and pianist, was born at Altona, June 23, 1824. He has been professor of the piano and of counterpoint in the Conservatory of Cologne, director of music in the University of Breslau and, for many years, conductor at the Gewandhaus, Leipsic, and director of the conservatory. His best works are for the piano, although his orchestral compositions and his cantatas and children's songs are deservedly popular.

Rembrandt (*rĕm'brănt*), **Hermanzoon,** commonly called Rembrandt van Rhyn, was born at Leyden, Holland, July 15, 1607. After attending the Latin school at Leyden and studying art under Peter Lastman at Amsterdam and under Jacob Pinas at Haarlem, he returned home and devoted himself to the study of nature. About 1630 he was encouraged to establish himself at Amsterdam, where he soon entered on a most successful career and executed numerous works, including those wondrous etchings, between three and four hundred in number, which have done almost as much as his paintings to give him so high and extended a reputation. Rembrandt's power and originality are exemplified in almost every branch of art, and as examples of composition, expression, color, light and shade his works rank with those of the greatest artists. He died at Amsterdam, Oct. 8, 1669.

REMBRANDT VAN RHYN

Remen'yi, Eduard, a distinguished Hungarian violinist, was born in 1830 at Heves. Being obliged to flee because he took part in the Revolution of 1848, he came to America, but returned to Europe shortly after, and earned great fame by his skill as a performer on the violin.

Rem'ington, Frederick, 1861-1909, American artist, illustrator, sculptor and author, was born in St. Lawrence County, N. Y. He early studied at Yale Art School and at the Art Students' League of New York, after which he led the life of a cowboy and stockman on a ranch in Montana and Wyoming, where he became notable as an animal painter and illustrator of western scenes and modes of life on the plains. He subsequently came into note as an illustrator for magazines, treating of military subjects and of ranching life and, after the Spanish-American War, of Cuban scenes and characteristics. His chief canvases and best-known paintings are *A Dash for the Timber, The Last Stand, Past all Surgery, The Last Lull in the Fight* and *Conjuring the Buffalo Back.* Among his leading works in sculpture are *The Broncho Buster* and *The Wounded Bunkie.* He is the author of *Pony Tracks, Crooked Trails* and *Frontier Sketches.*

Remora (*rĕm'ō-rȧ*), a sucking fish with an oval suctional disc on the upper surface of the head. By means of the sucker they attach themselves to sharks, turtles and even ships. They are found in warm seas and along the Atlantic coast north to New York. They are commonly exhibited in salt-water aquaria.

Rem'sen, Ira, distinguished American chemist and educator and successor to Dr. D. C. Gilman as president of Johns Hopkins University, was born at New York, Feb. 10, 1846. After graduating in 1865 from the College of the City of New York and in 1867 from the College of Physicians and Surgeons, he attended the Universities of Munich and Göttingen and for a time (1870–72) was assistant in chemistry at Tübingen. On his return to the United States he was professor of chemistry at Williams College, and in 1876 accepted the same post at Johns Hopkins. Besides his educational and administrative work and his researches in chemistry, he has written a number of treatises on theoretical and on organic chemistry. On the resignation of Pres. Gilman (*q. v.*) Dr. Remsen was chosen president.

Remusat (*rȧ'mū'zȧ'*), **Charles Francois,** a French politician and philosopher, was born at Paris, March 14, 1797, and studied with brilliant success at the Lycée Napoleon. On the establishment of the *Globe* in 1824, Rémusat became one of its contributors. He was exiled after the *coup d'état* of Napoleon III in 1851, but afterwards received permission to return. He devoted himself to literary and scientific pursuits till 1871, when President Thiers called him to the portfolio of foreign affairs, a posi-

tion which he held until 1873. He died at Paris, June 6, 1875. See translations of his mother's *Mémoires*.

Renan (*re-nän'*), **J. Ernest,** one of the most eminent authors of the 19th century, was born at Tréguier, France, Feb. 27, 1823. In his sixteenth year he was taken by Abbé Dupanloup to his seminary at Paris to be educated for the priesthood. After three years at this seminary, he entered St. Sulpice, the great seminary of the diocese of Paris. At St Sulpice his attention was mainly turned to the study of Hebrew, and to this study, of his own accord, he added that of German. The result of these studies was to destroy his faith in the supernatural or miraculous element in Christianity, and he therefore abandoned all idea of the priesthood and resolved to devote himself to literature. In 1860 Renan was appointed by Louis Napoleon a member of the commission to study the remains of Phœnician civilization. During this mission he visited Syria and Palestine and obtained acquaintance with the latter country, which enabled him to give such a vivid local coloring to his *Life of Jesus*, published two or three years after his return. In 1861 he was chosen professor of Hebrew at the Collège de France in Paris, but on account of his religious views was not fully established in that position until after the fall of the empire in 1870. Renan's published works are quite numerous, but the one by which he is most widely known is his *Life of Jesus*, which has been translated into the languages of all civilized nations. Renan died at Paris, Oct. 2, 1892.

ERNEST RENAN

Reni, Guido (*gwē'dō rā'nē*), a celebrated painter, was born near Bologna, Italy, Nov. 4, 1575. He studied under Calvaert, and at 20 entered the school of the Caracci. His first works, among them being the *Coronation of the Virgin*, are harsh and high in coloring. About 1596 he removed to Rome, painting there the *Aurora and the Hours*, his best work, now at the Rospigliosi palace. On account of a quarrel with Cardinal Spinola he left Rome and returned to Bologna, where he died on Aug. 18, 1642. His works are to be found in all the chief European galleries.

Re'production (in plants). In addition to the work of nutrition the plant must organize for reproduction. Two general types of reproduction are recognized. The first is vegetative multiplication, in which no such specialized bodies as spores are formed, but the ordinary vegetative body is used for this purpose. Among the lowest plants vegetative multiplication takes place by means of ordinary cell-division, and is the only method of reproduction used. In the more complex plants various outgrowths or portions of the body, as gemmæ, bulbs, buds, tubers, various modifications of branches etc., furnish means of propagation. The second kind of reproduction is by means of spores. Spores are specially organized to reproduce, and are not at all concerned in the nutritive work of the plant. There are two general types of spores, which differ from one another, not in their power, but in the method of their origin. The asexual spore is ordinarily produced by cell-division; the sexual spore is produced by the union of two sexual cells known as gametes. The general name of the sexually formed spore among plants is oöspore or, frequently, fertilized egg. The process by which spores form new plants is known as germination. See SPORES.

Reptiles (*rĕp'tĭlz*), a class of vertebrates, embracing four natural orders of living forms: I. *Chelonia*, the tortoises and turtles; II. *Lacertilia*, the lizards; III. *Ophidia*, the snakes and serpents; IV. *Crocodilia*, the crocodiles, alligators etc. The hatteria of New Zealand is related to the lizards, but stands in a group by itself. In the evolution of life the reptiles were the forms that first became independent of the water and began to live entirely on land. Reptiles and birds, although so different in form and habits, are united by many peculiarities of structure. Huxley proposed a common name (*Sauropsida*) uniting the two classes. In addition to the living forms there are many extinct forms which extend the classification and best show the resemblances between birds and reptiles. The plesiosaurs were enormous water-animals with extremely long necks. Fossils are found indicating their length to have been about 40 feet. The ichthyosaurs were long water-animals attaining 30 or 40 feet in length. The dinosaurs show many bird-like peculiarities. They lacked the power of flight and lived both on land and in the water. Some forms reached a length of 60 feet. The pterodactyls were flying reptiles with membranous wings, which in some cases had an expanse of 25 feet.

Repub'lic, Grand Army of the, is an organization composed of those who were soldiers and sailors in the Federal army and navy during the Civil War — the men in blue who upheld the flag and saved the Union. Its object is to preserve the spirit of comradeship among those who stood side by side amid the hardships and perils of war; to care for sick and disabled soldiers; to provide for the widows and orphans of

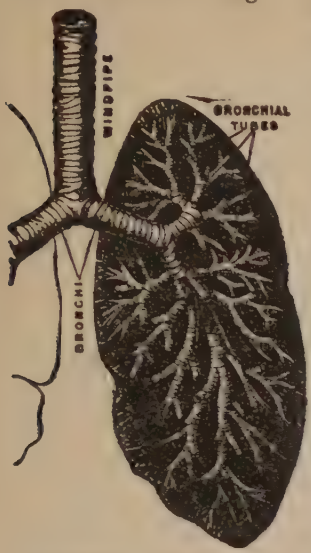
those who fell in field or hospital or have since died; to stand by each other while living; and to bury those who answer the final call as the years go by. The organization was first suggested and planned by Dr. B. F. Stephenson of Springfield, Ill. The first post was organized early in 1866, and on July 12 of that year a meeting of representative soldiers from all parts of the state was held at Springfield, where they were mustered in and given authority to organize posts throughout the state. The organization grew rapidly and extended to other states. The posts in each state constitute a department, and the organization in 1910 had 5,923 posts, with a membership of 203,410. The losses by death in the preceding year were 9,151. The motto of the order is Fraternity, Charity and Loyalty. The badge of the Grand Army consists of an eagle and a star, connected by a ribbon representing the flag. A bronze button is also worn as an every-day insignia of the order. The order is strictly non-political, and none but honorably discharged soldiers can become members. There are frequent campfires, reunions and banquets, and once each year a grand, national encampment is held. At these meetings greetings are exchanged, memories are revived, the old songs of the war are sung again and the unwritten history of the war is recalled. Under the auspices of the order large sums are every year expended in charity. Hundreds of soldiers' and sailors' monuments have been erected, orphans' homes have been built and endowed in many states, and a helping hand has been given to thousands of old soldiers and soldiers' widows and orphans. The membership is now rapidly reduced each year by death.

Res'ins, a class of natural vegetable products, closely allied to the essential oils and in most cases obtained from the plants which yield them mixed with oil. Resins are divided into hard, soft and gum resins. Hard resins are solid and brittle, and contain little or no oil. Such are copal, lac, mastic, jalap etc. Soft resins can be molded by the hand, and some are sticky and semi-fluid. These are called balsams. They are the solutions of hard resins in essential oils, or are admixtures of the two. Turpentine, storax and the balsams of Tolu, Peru and Canada are examples. Gum resins are the milky juices of certain plants made solid by exposure to the air. Resins are widely diffused throughout the vegetable kingdom, and are much used in medicine and in the mechanic arts. They are generally obtained by making incisions in the wood from which they are obtained, although it is sometimes necessary to use boiling alcohol to extract them from the wood. The common resin or rosin of commerce exudes from several species of pine, and is used in the preparation of ointments and plasters and for various other purposes.

Resonance (*rĕz'ô-năns*), in physics the process by which one body sets in vibration another body having the same period of vibration. When one attempts to ring a large church-bell, he soon learns that he must pull the rope at certain definite intervals if he wishes to ring with ease. A row-boat moored in quiet water can, without difficulty, be set rocking if one throw his weight, first on one side then on the other, at correct intervals. If two pendulums of the same period be mounted upon one common frame, and then one pendulum be set in vibration while the second is at rest, the second pendulum soon "picks up" a vibration of considerable amplitude from the first pendulum. These are instances of resonance, taken from mechanics. In acoustics and electricity there also are many illustrations. A tuning-fork held over a tall jar partially filled with water will have its sound much reinforced when the column of air in the jar above the water is capable of vibrating in the same period as the tuning-fork. The sounding-box of the guitar and violin are in resonance with the strings and enable them to give out energy at a more rapid rate. Electrical resonance is frequently employed in wireless telegraphy. For a complete theory of resonance see Donkin's *Acoustics*.

Res'pira'tion (in plants) is the process by which most plants set free in their bodies the energy required for doing the work necessary to maintain life and form new parts. It essentially is identical with the respiration of animals. It consists of several separate but related processes: (1) the absorption of oxygen and its union with the protoplasm or with foods by the action of the protoplasm; (2) the decomposition of this unstable substance, resulting finally in the formation of carbon dioxide and water; (3) ridding the body of these waste products. The oxygen is absorbed directly from the water or air by smaller plants, but in the larger it is distributed to the internal tissues by a system of air passages (see AËRATION). Through a reverse process the carbon dioxide is got rid of. The chemical details of respiration are not known. It even is uncertain whether it is the living protoplasm or the foods that are oxidized. Neither is it known how the energy is used nor in what form it is set free. Some of it appears as heat, making the body warmer than the surrounding air. But this heat is so quickly lost that it can only be observed when dissipation of it is hindered. In this the plant is like a cold-blooded animal. On account of the carbon dioxide excreted, the plant loses weight, unless supplied with food; thus, if a seed germinate in darkness, after a few weeks the plantlet may have less than half the dry weight of the seed from which it grew.

Respiration, Organs of, are of two kinds: Gills and lungs. The former are adapted for respiration in water, the latter for action in free air. Gills are found in clams, crayfish, squids and other invertebrates as well as in all fishes. The essence of respiration consists in an exchange of oxygen and carbon dioxide (CO_2) between the blood and the air. Special organs of respiration are not necessary to accomplish this end. The earthworm, for example, breathes through the skin; that is, the blood comes close to the surface in thin-walled vessels, and the exchange between it and the air is accomplished. In the simplest animals, like the amœba, where there is no blood, the breathing is done by the protoplasm of the body, but the exchange of carbon dioxide for oxygen is essentially the same as in higher animals. It must also be understood that respiration (*q. v.*) in plants is of the same nature as in animals. The old statement that plants breathe carbon dioxide (carbonic acid gas) in the sunlight, giving off oxygen, and in darkness reverse the process is not true. In breathing they take in oxygen and give up carbon dioxide at all times, and the process is more active in sunlight than in darkness. It is easy to point out how the erroneous idea in reference to their breathing arose. Plants use carbon dioxide in their process of nourishment, and they return free oxygen to the air as a left-over product. This comes mainly from the process of starch-formation; and, as that process takes place in the sunlight, it was at first supposed that the oxygen was set free in daylight from the process of respiration.



WINDPIPE, BRONCHI AND ONE LUNG

Fishes possess gills throughout life; the amphibia have them in larval stages, and, in some forms, both gills and lungs exist in the same individual. Lungs make their first appearance in the *dipnoi* (*q. v.*) and occur in all animals of a higher grade. Lungs are developed in all animals as sac-like expansions of the walls of the pharynx, blood vessels are spread over them, and air is introduced into the inside. In the human body the lungs become very complicated. The windpipe divides into two main branches — the bronchi. These enter the lungs, and are subdivided again and again into the bronchial tubes, which branch like the twigs of a tree. The smallest divisions enter into air-sacs, which are lobulated and have very thin walls. A network of capillaries is spread over the thin walls of the air-sacs, and it is in these capillaries that the exchanges between air and blood go on. The blood does not anywhere come into actual contact with the air, but the exchange of gases is made (by osmosis) through the thin membranes of the air-sacs and the capillaries. The substance of the lungs is spongy, and considerable elastic tissue enters into their structure, which allows them to expand and contract. It is not possible in an illustration to give a true picture of the complexity of the lungs. Not only bronchial tubes branch through their substance, but blood-vessels which carry blood to be aërated, others which carry arterial blood to nourish the lungs, besides lymphatics and nerves, branch through. The oxygen received by the lungs is carried to the minutest parts of the tissues, and is there given up in exchange for carbon dioxide. It therefore is clear that there are an *external* respiration taking place in the lungs and also an *internal* respiration taking place in the tissues throughout the body. The latter is the more important part of the process of respiration. The air is renewed in the lungs through the action of the diaphragm and other muscles. For the amount of air breathed and other details see Huxley's *Lessons in Elementary Physiology* or any other good textbook of physiology.

Reszke (*rĕsh'kĕ*), **Jean de,** an operatic singer (tenor), was born at Warsaw, Poland, on Jan. 14, 1853. He attained a reputation as a singer while a boy; and, although he had been destined for a lawyer, he soon quitted his profession for the operatic stage. He appeared in 1874 in Venice and in 1875 in London, singing a barytone part; but was convinced that his voice is more truly a tenor. Accordingly he re-appeared in 1879 as a tenor, and is now recognized as one of the world's finest artists in *Robert le Diable, Faust, Lohengrin, Aida, Le Cid, Tristran* and *Romeo and Juliet.* Jean de Reszke was a favorite performer for a long period of years at the Metropolitan Opera House, New York.

JEAN DE RESZKE

Retort', a vessel employed by chemists for distilling or effecting decomposition by means of heat. It may be made of glass,

earthenware or mental according to the purpose for which it is to be used. Glass retorts are the most common; but, in cases requiring a higher degree of heat than glass can bear, earthen retorts are used, and iron retorts are necessary in the laboratory for many processes.

Reunion is an island belonging since 1764 to France, formerly called Ile de Bourbon, southwest of Mauritius and about 420 miles east of Madagascar. It has a total area of 965 square miles and a population of 173,315. It is administered by a governor, privy council and elected legislature; is represented in the French Parliament; and includes 30,000 Chinese, Hindus, Malagasi and Negroes among its non-European residents. St. Denis, the capital, had a population of 27,392; There are 161 schools with 16,827 pupils. The principal seaport, Pointe-des-Galets, is connected with St. Benoit and St. Pierre by a railway 83 miles long belonging to the government. The chief imports are rice and grain; the exports, chiefly sugar, rum, coffee, vanilla and spices.

Reuter (*roi'tĕr*), **Fritz,** a novelist and poet who wrote in the Low-German dialect, was born at Mecklenburg-Schwerin, Nov. 7, 1810. While studying law at Jena in 1833, he became involved in some of the revolutionary schemes of the students' association, and was arrested and sentenced to thirty years' imprisonment. He was released after seven years' confinement in Prussian fortresses; and a few years later began to write the books which spread his name throughout all Germany. His tales have the flavor of real life, and prove their author a born story-teller. He died at Eisenach in Thuringia, July 12, 1874. See M'Callum's *Studies in Low-German Literature*. See PLATT-DEUTSCH.

Revere', Mass., a coastal town in Suffolk County, is five miles from Boston. It is a residential town and a popular summer resort, having good schools and a number of churches. It has a memorial to Paul Revere, a town-hall, a Carnegie Library and Massachusetts Bath-House, which is owned and maintained by the state. The town was settled in 1627, and was known as Rumney Marsh. It was part of Boston until 1738, and in 1739 it was incorporated as Chelsea. It was re-incorporated and set off in 1846 as North Chelsea, and in 1871 the name was changed to Revere. Population 18,219.

Revere, Paul, a Revolutionary soldier famous for his midnight ride from Boston to Lexington to warn the militia of the approach of the British soldiers, was born at Boston, Jan. 1, 1735 Revere was one of the party that destroyed the tea in Boston harbor, and was at the head of a volunteer committee to watch the British. When it was known that the latter intended to move to Concord, Revere crossed to Charlestown and on the night of April 18, 1775, rode to Lexington, rousing the minute-men on his way. "The fate of a nation was riding that night." He was stopped at Lexington, but a companion succeeded in reaching Concord. Revere rose to the rank of lieutenant-colonel of artillery during the war, and after independence was secured established the Revere Copper Company at Canton, Mass. He died on May 10, 1818. His ride has been made the subject of a fine poem by Longfellow.

Revolv'er, a small fire-arm, an improved pistol, which by means of a revolving breech or revolving barrels can be made to discharge more than once without reloading. The invention is far from being new, specimens being still in existence which were manufactured during the 17th century: but in 1835 Colonel Samuel Colt patented Colt's revolver, which was a great advance on all previous experiments and substantially is still in use. It consists of one rifled barrel and a revolving cylinder with six or seven chambers, which are successively brought into line with the barrel by the action of the trigger. Each chamber has its nipple for a cap, which is brought under the hammer by the motion which brings the chambers around to the barrel. In addition to this, by withdrawing a bolt the breech-piece may be taken out and replaced by another of the same kind with chambers ready loaded. Revolving fire-arms of larger size are used in wars, the best known of which is the French *mitrailleuse*, of which so much was heard during the Franco-Prussian War of 1870. See GUN.

Rey'nard the Fox is the title of a celebrated fable of the middle ages, being the last of a series of poems in which wild beasts are the speakers and actors. It was written in Low German, professedly by Hinrik van Alkmer in 1498; but most German critics say the real author was Hermann Barkhausen, who published his book under a pseudonym.

An outline of the story may be briefly given as follows: When Nobel the lion, king of beasts, was holding his court one Eastertide, all the animals, great and small, came and paid homage, except Reynard the fox; and for his various misdeeds Reynard was summoned to appear before the lion, Bruin the bear being sent to summon him. Reynard, however, told the bear of some honey hid in a split tree, in which Bruin got himself fast and nearly beaten to death by some peasants before he got back to court. Tibert the cat was the next messenger; but Reynard persuaded him to go and catch some mice in a place where there was a noose, in which the cat was caught and suffered a beating before he got away. At last Grimbart the badger went to summon Reynard and persuaded him to appear at court, where he was tried and condemned to death. But just before he was to be hung on the gallows he asked leave to make a speech, in

the course of which he told the lion that old Reynard his father, in connection with Isengrim the wolf and Bruin the bear, had formed a conspiracy to kill the lion and make Bruin king in his place; but he (Reynard) had stolen their treasure and hidden it, as he could not bear to see the noble lion killed and the wicked bear made king in his place. After hearing the story, the lion pardoned Reynard and put the wolf and the bear in prison. But when the lion asked Reynard to show him where the treasure was, he excused himself because he was under an oath to make a pilgrimage to Rome. The lion then let him go; and Reynard immediately set out on his pilgrimage, taking with him Cuwært the hare and Belin the ram. On his way he passed his own house, and induced Cuwært to go with him, and there killed him. Putting the hare's head in a satchel, he gave it to the ram, telling him to carry it back to the lion, as it contained valuable letters. When the lion saw the hare's head he was very angry, and at once released the wolf and bear from prison and declared the fox an outlaw. Another version of the fable adds an account of a fight between the wolf and the fox, in which the latter by his trickery won the victory, and finally returned to his own home, honored with the favor and protection of the lion.

Reyn'olds, John Fulton, an American soldier and major-general of volunteers, was born at Lancaster, Pa., Sept. 20, 1820. He graduated at West Point in 1841 and got a lieutenancy in 1846, after which he served in the Mexican War, was engaged against the Rogue River Indians in the Utah expedition and in 1859 became commandant of West Point. In 1861 he was appointed brigadier-general of volunteers, and took part in the campaigns of the army of the Potomac. After serving with distinction in the Peninsular campaign and saving the Union army at the second battle of Bull Run from a disastrous rout, he gained the rank of major-general and succeeded Hooker in the command of the First Army Corps. On the first day at Gettysburg he was struck by a rifle ball, which unhappily ended his promising career, July 1, 1863.

Reynolds, Sir **Joshua,** a highly distinguished English portrait-painter, was born near Plymouth, July 16, 1723. His father designed him for the medical profession, but, as he early manifested a desire to be a painter, he was placed at 17 under the instruction of Thomas Hudson, the principal portrait-painter of the day. In 1746 he went to London, and set up a studio there; but, being invited to accompany Commodore Keppel on a cruise to the Mediterreanan in 1749, he made his way to Rome, and remained about three years in Italy, studying the works of Raphael and Michael Angelo and visiting the chief art-collections. On returning to London in 1752, his works attracted great attention. When the Royal Academy was instituted in 1769, he was elected its first president. He was knighted by George III. When Ramsay died in 1784, he succeeded him as painter to the king. He died in London, Feb. 23, 1792, and, after lying in state at the Royal Academy, was interred in the crypt of St. Paul's. Reynold's fame lies in the superior beauty and excellence of his portraits. He was at home alike in portraying the strength of manhood and the grace of womanhood; and his pictures of children have especial tenderness and beauty. He was a man of fine and varied culture, and lived in friendly intercourse with Johnson, Burke, Goldsmith and other literary men of his day. He was also distinguished for an amiable disposition and the most pleasing manners, fully justifying the eulogium of Goldsmith:

> Still born to improve us in every part,
> His pencil our faces, his manners our heart.

Rhad'aman'thus, in Greek mythology, a son of Zeus and Europa; one of the three judges of the dead on their descent into the nether world. The other two were Æacus and Minos (brother of Rhadamanthus), king and lawgiver of Crete. Before these three, according to the fable, all the dead appeared when they reached the lower world, to give account of their stewardship and receive the reward of their deeds.

Rhea (*rē'ȧ*) or **Nan'du,** the ostrich of the New World. The rheas are running birds, living in herds on the grassy plains of South America and feeding on grasses, seeds of herbs and some varieties of berries. Their wings are better developed than in other running birds, but do not suffice for flight. The larger varieties reach a height of about six feet. The female lays from ten to twenty-three eggs in a depression in the ground made by the male. Their feathers are of coarser quality than those of the African ostrich, and are used mainly for rugs, dusters and brooms. There are three species. The more common one is brownish-gray above and nearly white on the belly. It ranges from southern Brazil to the Straits of Magellan. Another smaller form, with some feathers having white tips, inhabits Patagonia; and a third, dark-colored form lives in northeastern Brazil.

Rheims (*rēmz*) or **Reims,** a city in the French department of the Marne, about 100 miles from Paris by rail. Clovis was baptized within its walls. In the 8th century it became the seat of an archbishop, and from 1179, when Philip Augustus was solemnly crowned here, it became the place for the coronation of the kings of France. Joan of Arc, after her great victories, brought the dauphin here to be crowned, and the only sovereigns down to 1825 who were not crowned here were Henry IV, Napoleon I and Louis XVIII. In 1793 the cathedral

was attacked by the populace, and in 1830 the ceremony of crowning at Rheims was abolished. The hills which surround the town are planted with vineyards, and Rheims is one of the great centers of woolen manufacture in France. Its Gothic cathedral, one of the glories of architecture was ruined by German bombs in 1914. A wealth of tapestry, sculpture and paintings adorned the interior; innumerable statues of artistic grace beautified the outside; and the rose-window was of rare magnificence. Population 108,385.

Rheingold (*rīn'gōlt*), **Das.** The prelude of Wagner's tetralogy of *The Niebelungen Ring*. First performance at Munich, Sept. 22, 1869, under the direction of Franz Wüllner, whose tact and ability successfully overcame the difficulties attending its first production. The poem, *Das Rheingold*, was not written until after *Siegfried* and *Die Walküre* had been dramatised. The music was completed in May of 1854. An exceptional number of instruments is required by the score. For instance, where ordinarily two or four horns would suffice, Wagner uses eight. The band of brass instruments is enlarged, with wonderful effects in sonority. At the close of *The Rhinegold* six harps are used in the rainbow scene. The full score was published in 1873.

Rheot'ropism the sensitiveness of a plant to the direction of a current of water, to which it responds by changing the rate of growth, which results in a curvature with or against the current. When roots of corn or vetch are grown in moving water, the rate of growth is hastened on the side not struck by the current and slowed on the other side; consequently the tip is turned up-stream. A very slow current will produce the reaction. The exact nature of the stimulus has not yet been determined. See IRRITABILITY.

Rhine, the most important river in Germany and one of the most noted in the world, takes its rise in Switzerland, and, after a northerly course of about 850 miles, empties into the German Ocean. The area drained by the Rhine and its feeders is estimated at nearly 100,000 square miles. It is divided into the Upper, Middle and Lower Rhine, the first being the river from its source to Basel, the second its course from Basel to Cologne and the third its course from Cologne through the Netherlands to the sea, into which it empties by mouths forming an extensive delta. Canals connect the Rhine with the Rhône, the Danube and other rivers, opening lines of communication with France and Belgium on one side and with the Netherlands and every part of Germany on the other. The delta, most of which lies below the sea, has to be protected by strong embankments or dikes, the principal ones rising 25 or 30 feet above the lowest level of the river.

Rhinoceros (*rī-nŏs'ĕ-rŏs*), a thick-skinned animal with a horned snout, confined to tropical Africa and Asia. There are two species in Africa and three in Asia. The African species embrace a two-horned and a one-horned variety. The latter is the wide-mouthed rhinoceros, sometimes called white, although its skin is of a slaty color. It is the largest of the family, a full-grown male, according to Selous the celebrated hunter, standing six and one half feet high at the shoulders. The largest of the Asiatic species also has a single horn. It is ten feet long and five feet high at the shoulders. There are enormous folds in the skin which appear like huge plates of armor. Another form, inhabiting Sumatra, has two horns on the snout. The horn is a powerful weapon. Besides being used in attack, it is strong enough to root up small trees, which the animal sometimes does, for the sake of the fruit and foliage. They are shot with iron and tin bullets, as the hide is so tough that leaden bullets will not penetrate it.

INDIAN RHINOCEROS

Rhizoids (*rī'zoids*). Usually hair-like outgrowths from plant-bodies which act as holdfasts and, often, as absorbing organs. The name means root-like, but the similarity is by no means one of structure, but rather one of general function in relation to the outside world. Rhizoids are mostly developed by the lower plants, as, for example, in connection with the anchoring of sea-weeds, on the underside of the thallus-bodies of liverworts, from the base of the erect moss-plants, from the under side of the prothallium of ferns etc.

Rhizome (*rī-zōm'*). See ROOT'-STOCK.

Rhode Island, one of the original thirteen states and the smallest state in area in the American Union. Its greatest length from north to south is between 40 and 50 miles, and its width is less than 40, its land-area being but little over 1,050 square miles. It is bounded on the north and east by Massachusetts, on the south by the Atlantic and on the west by Connecticut. The state is divided into five counties, its principal cities being Providence (the capital), Newport, Central Falls, Pawtucket and Woonsocket. Narragansett Bay, which occupies the southeastern quarter of the state, contains a number of beautiful islands, on the largest of which, named Rhode Island, is Newport, a famous summer-resort, for-

merly one of the two capitals. The country is hilly, and the soil rough and stony, being chiefly devoted to pasturage and orchards. The minerals consist of building-stone, talc, lime and graphite. The principal rivers are the Pawtucket, Blackstone and Pawcatuk. In the main they supply waterpower for the numerous factories.

Rhode Island is a manufacturing state, having nearly 300 million dollars invested in various enterprises. The principal lines of industry are cotton, woolen and knit-goods factories. There also are dyeing and finishing establishments; foundry and machine-shop products and rubber and elastic goods are manufactured. Much cheap jewelry is made, and no better solid silverware is manufactured in the United States than in Rhode Island. The fisheries employ about 2,000 people and have a valuation of one million dollars annually. It was at Pawtucket in 1790 that the first cottonspinning works in the United States were established. Educationally the state does most creditably, expending nearly two million dollars a year. The pupils enrolled number 80,110, and the average daily attendance is 61,487. It has 247 high-school teachers and 6,021 high-school pupils. The state maintains a normal school with 38 teachers and an agricultural school with a faculty of 25. At Providence is Brown University (*q. v.*). There are a state sanitarium for consumptives, a state home and school for children, institutions for the deaf and insane, a state work-house, house of correction, a state-prison and many benevolent establishments.

Rhode Island was settled in 1636 by Roger Williams (*q. v.*) and his Baptist companions, who were expelled from the Puritan colony in Massachusetts on account, partly, of their religious opinions. It is also believed to have been the Vinland of the Norsemen, who explored its coast in the 10th century. Population 620,090.

Rhodes (*rōdz*), an island in the Mediterranean belonging to Turkey, formerly an independent state of ancient Greece. It is about 50 miles long and 20 broad, and is traversed by a chain of mountains, the highest peak reaching a height of 4,070 feet. The island was inhabited at a very early period, and is said to have sent nine ships to the Trojan War. In 404 B. C. the city of Rhodes was founded at the northern extremity of the island, and after that the history of the island is comprised in that of the new city. The city was girt by strong walls surmounted by towers, and was furnished with two good harbors. At the entrance to one of its ports stood a brazen statue of Helios, 70 cubits in height and called the Colossus of Rhodes. Besides this statue, which was one of the seven wonders of the ancient world, there were 3,000 others in the city, of which 100 were colossal. The arts were cultivated in Rhodes, and intellectual activity showed itself long after it had declined in other parts of Greece. After the death of Julius Cæsar, whose side the Rhodians had taken in his contest with Pompey, they were defeated in a naval engagement by Cassius, who entered the city by force, seized the public property and rifled the temples. During several centuries Rhodes remained under the power of the Byzantine emperors. In 1309 it fell into the hands of the Knights of St. John of Jerusalem, who retained possession until 1523, when they were besieged by the Turks and compelled to sail away to Crete; and the island has remained a Turkish possession ever since.

Rhodes, Cecil John, English and South African statesman, railway projector and mining operator, was born at Bishop Stortford, England, where his father was rector of the parish, July 5, 1853. After graduating at Oxford, he went to the Cape of Good Hope in 1871 for his health, and settled at Kimberley, engaged in diamond-mining and began to dream of a united British South Africa and of a railway project that would connect the Cape with the Zambezi and ultimately through Egyptian Sudan with Cairo. Cape politics for a time attracted him, and he entered the local legislature and became prime minister, but resigned in consequence of the Jameson raid. In 1893, in alliance with the Dutch Afrikander party at the Cape, he took the field against the warlike Matabele and subdued them; after which he obtained mining rights over what is now Rhodesia, which he did much to develop. By this time, while working out his schemes of British expansion in the country, he had formed the great De Beers mine consolidation, where he amassed great wealth. When war in the Transvaal broke out, he went to Kimberley, and remained there during the investment of the great diamond-mining town by the Boers, raising and equipping at his own expense a town-guard of 400 men at a cost of $75,000. He died on March 28, 1902.

Rhodesia (*rō-dē'zĭ-ȧ*), named from Cecil Rhodes, is bounded on the northwest and north by Congo Free State, on the north and northeast by German East Africa, on the east by Portuguese East Africa, on the south by the Transvaal and the Bechuanaland Protectorate, and on the west by German Southwest Africa and Portuguese West Africa or Angola, comprising all the territory formerly known as British South and Central Africa, north of the twenty-second parallel, excepting the British Central Africa Protectorate. Rhodesia is divided by the Zambezi into Southern and Northern Rhodesia, Southern Rhodesia into Matabeleland and Mashonaland, and Northern

Rhodesia into Northeastern and Northwestern Rhodesia. Southern Rhodesia has an estimated area of 144,000 square miles and a native population estimated in May, 1911, at 743,640, 497,165 in Mashonaland and 246,475 in Matabeleland. In 1911 there were 11,039 Europeans in the former and 12,543 in the latter province. The entire country is administered by the British South Africa Company through its administrator and by a resident commissioner appointed by the secretary of state, with executive and legislative councils. Natives and non-natives stand equal before the law except in regard to spirits and arms and ammunition.

Gold-fields with a total estimated area of 5,250 square miles have been discovered in Rhodesia, and 300 companies and syndicates had registered for mining and development work before 1906. Gold to the amount of 231,872 ounces was produced in 1903 and 267,737 ounces in 1904. There are 600 square miles of coal-fields about Wankie, 203 miles northeast of Bulawayo, and a company has been formed for their exploitation. Silver, copper, antimony, blende, arsenic and lead have been found. Southern Rhodesia belongs to the South African Customs-Union. The railway from Bulawayo to the Wankie coal-fields was finished in September, 1903, and 212 miles were thus added to the line up the continent from the Cape. On April 25, 1904, it had been pushed on to the Victoria Falls on the Zambezi, and is heading for Lake Tanganyika across North Rhodesia. In 1906 it was open 374 miles north of Victoria Falls. A branch-line from Bulawayo to Gwanda, 120 miles south, was opened in 1903, and the line to the Matopos the same year. Salisbury is connected with Bulawayo by way of Hartley and Gwelo, and the line from Beira to Umtali has also reached Salisbury, the narrow gauge of the latter having been standardized. Salisbury is also connected with the Ayrshire mine in the Lomagundi district by a narrow-gauge road, a distance of 84 miles. The line between Gwelo and Selukwe is also open for business. The route between Salisbury and Mazoe has been surveyed for immediate construction. Nearly 3,000 miles of railway have been built in northern and southern Rhodesia. In Southern Rhodesia there are 3,000 miles of post-roads, maintained at a cost of over £8,000 a year. The Rhodesian telegraph-system, including the African Transcontinental Telegraph Company's lines and those belonging to the police-telephone service, aggregated 3,984 miles of line and 7,118 of wire, with 99 offices open. Direct communication by wire is opened between Umtali and Beira, and the trunk-line, now 1,600 miles long, has reached Ujiji by way of Blantyre and Karonga. The telephone systems are extensive. The penny-post prevails, and there are 73 postoffices in Southern and 35 in North Rhodesia.

Northern Rhodesia, formed by the amalgamation of Northeastern and Northwestern Rhodesia in 1911, has an area of about 190,000 square miles and a population of approximately 1,000,000. The Europeans number 1,434. The territory is divided into ten magisterial districts, with administrative headquarters at Livingstone, on the Zambesi. A good road exists between Lakes Nyasa and Tanganyika and the telegraph line runs from Zomba in the Protectorate to Ujiji. The slave-trade has been suppressed throughout the country, and strict regulations regarding spirits and trading with the natives are in force.

The authorized capital of the British South Africa Company is £9,000,000, of which nearly all has been issued, besides £1,250,000 in debentures. The total revenue for the year ending March, 1911, was £1,163,874; the expenditure £993,264.

Rhodes Schol'arships. Cecil Rhodes (*q. v.*) of South Africa by his will endowed a large number of perpetual scholarships entitling each of the recipients to spend three years at England's famous University of Oxford, with an annual income of $1,500. These scholarships are distributed among English-speaking people throughout the world, each state and each territory in the United States being entitled to two representatives. Mr. Rhodes' object was to bind all English-speaking people in sympathy and esteem, by means of the social contact and the mutual understanding which such a plan should bring about.

Candidates are to be selected on the basis of four qualifications: (1) Attainments in scholarship, as tested by preliminary examinations in Latin, Greek and mathematics; (2) fondness for and success in outdoor sports; (3) unselfishness and good fellowship; and (4) moral force of character and zeal in the performance of public duties.

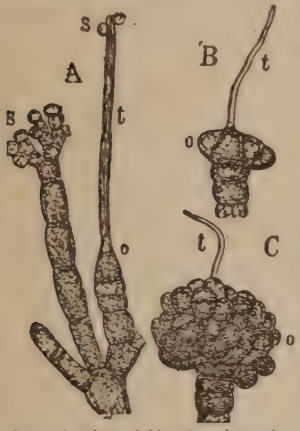
It would seem that those best suited for the scholarships are those who have already received the A.B. degree, as the majority of those who have not attained to this standard lack the breadth and maturity necessary for profiting fully from the splendid opportunities afforded by the social life at Oxford.

The first of the Rhodes scholars began their residence at Oxford in 1903, and those who have recently returned to America report high respect for British institutions.

Rho'doden'dron, a genus of trees, shrubs and various forms of heath, which includes some 200 species, is an evergreen, in many of its species native to North America and in many others to Asia and, especially, the Himalayas, Borneo and Java. Rhododen-

drons have been cultivated as garden-plants with great success. Many hybrid forms have beautiful and conspicuous flowers, without having lost the hardiness of the native species. The plants of the genus flourish in a moist but well-drained soil, preferably somewhat of the nature of vegetable mould. Thickets of *rhododendron maximum* are among the beauties of the Alleghanies, some having carmine, others lilac-colored, others purple flowers.

Rhodophyceæ (*rō'dō-fĭs'ē-ē*), plants commonly known as the red algæ. The red color is due to the presence of a pigment in addition to the ordinary chlorophyll which belongs to all algæ. They mostly are marine forms and are anchored by holdfasts, belonging to the deepest waters in which algæ grow. Their bodies are much more delicate than those of the brown algæ or kelps, their graceful forms, delicate texture and brightly tinted bodies (shades of red, violet, dark purple and reddish brown) making them very attractive. They show the greatest variety of forms, branching filaments, ribbons and filmy plates prevailing, sometimes branching very profusely and delicately and resembling mosses of fine texture. They are among the most prized souvenirs of a visit to the seashore. Red algæ are very peculiar both in asexual and in sexual reproduction. Every sporangium contains just four asexual spores, and, contrary to the usual alga habit, these spores have no cilia or power of motion. Since they are always produced in fours, they are called tetraspores. The female sex-organ also is very peculiar. In the ordinary algæ the oögonium consists of a single, large, spherical cell. Among the red algæ, however, this spherical cell is transformed into a flask-like body, with bulbous base and an elongated, almost hair-like neck. This female organ, on account of its peculiarities, is often called by a special name, carpogonium, the tubular hair-like process being called the trichogyne. The male cells come in contact with the trichogyne in the process of fertilization.



A red alga (*A*), showing the female organ (*o*) with its trichogyne (*t*), the male cells (*s*) and the resulting spore case (*B*, *C*).

Rhone (*rōn*), the only important French river which falls into the Mediterranean, rises in the Swiss Alps not far from the sources of the Rhine, its entire length being about 500 miles. There is sufficient depth for good-sized vessels from Lyons southward, but, on account of the rapidity of the current and the shifting of sand-bars, navigation is difficult and at times impossible. On account of these obstructions, which are greatest near the mouths of the river, communication with the Mediterranean is in great part dependent upon the canals which connect the Rhône with the Rhine, the Seine and other rivers.

Rhu'barb, species of *Rheum*, a genus of the buckwheat family. Common garden rhubarb or pie-plant is *R. rhaponticum*, native to the Old World. The genus is very closely related to the common docks, many of which resemble the rhubarb in habit.

Ribault (*rē'bō'*), **Jean,** a French Huguenot, was born at Dieppe about 1520. He was sent by Admiral Coligni to establish a colony of French Protestants in North America. He set sail with an advance party on February 18, 1562. Having built a fortress at Port Royal Harbor, he left a garrison of 30 men in charge and returned to France. He found the country in the throes of civil war and was unable to return or to send provisions. After enduring great sufferings the men abandoned the fort and attempted to return to France, in an old vessel which managed to hold together for a time. When it was about ready to collapse, the men fortunately were picked up by an English cruiser and taken to London. In 1564 Ribault was made governor of a proposed colony in Florida and René de Laudoniere was sent out with colonists. In May of 1565 Ribault again sailed, this time with seven vessels and 300 men. He arrived on August 28, and shortly afterward some Spanish colonists under Menendez de Avilez made an attack upon his ships. He set out to retaliate, but his vessels were wrecked by a storm and he was obilged to attempt to return to the fort overland. In the meantime the Spaniards had marched overland, captured the fort and murdered all the occupants, except a few who made their escape in a couple of old vessels. Ribault and his men surrendered to the Spaniards under assurances of safety, but in October of 1565 they were put to the sword.

Rib'bon, a narrow band or strip of woven silk. Ribbons have been made an important article of commerce only during the last two centuries, the chief seats of their manufacture being Etienne, France; Basel, Switzerland; and Coventry, England. Of the names which indicate the kind of groundwork, grosgrain is a ribbed silk, plush a velvety or piled surface, satin a smooth, polished surface etc.; and there are various mixtures of these, making an almost infinite variety of decorative effects both in color and weaving.

Ricardo (*rĭ-kär'dō*), **David,** an eminent political economist, was born of Jewish parentage at London, April 19, 1772. At an early age he became a partner with his father as a stock-broker; but, when he married outside the Jewish race, a misunderstanding arose between them and the partnership was dissolved. Young Ricardo then set up in the same business himself, and in a few years realized a large fortune, while preserving an honorable reputation throughout his business career. In 1809 he published *The High Price of Bullion a Proof of the Depreciation of Bank-Notes*, which was a clear and able argument in favor of a metallic basis for the currency of a country. After publishing a number of other successful pamphlets, Ricardo brought out his greatest work, the one on which his fame chiefly rests: *The Principles of Political Economy and Taxation.* This work, while not a complete treatise on political economy, may be regarded as a very able discussion of some of its principal factors, as value, wages, rent etc. Ricardo entered Parliament in 1819, and retained his seat in that body until his death, which took place at Gatcomb Park, Gloucestershire, Sept. 11, 1823.

Rice, the well-known grain of *Oryza sativa*, extensively cultivated in Asia, where it is also native. The genus belongs to the grass family and contains about 20 described species, and perhaps these may all be considered as varieties of *O. sativa.* Rice supplies food for more human beings than does the product of any other plant. It is the principal, and often the only, food of millions in China, India and the Malayan Islands. It is the staple crop of China, and two food-crops a year are raised, while a third is plowed under as a green fertilizer. The Chinese do not always grow rice on alluvial flats, but cultivate a dry-soil variety on hill-slopes as if it were an ordinary cereal, only irrigating it. In India between a third and a half of all the land cultivated is given to rice-growing. In Bengal it is the staple crop, and the hill-tribes in all parts of India also raise rice. In 1647 Sir William Berkeley tried to raise rice in Virginia, but the experiment failed. In 1694, however, Thomas Smith of Charleston, S. C., grew almost enough to meet the needs of the colony, and the American rice-industry began. Water-culture began in 1784, and the superiority of American rice was well-established long before 1860. But since 1865 a still better quality has been produced. Before the Civil War Georgia and the Carolinas were the only states in which rice was raised to any great extent. Though they still retain their rice-fields, Louisiana and Texas have taken gigantic steps as growers of rice. In 1900 Louisiana was supplying 80 per cent. of all the rice raised in the United States. The opening of the Calcasieu country — southwestern Louisiana from Atchafalaya River to Sabine River — called attention to Texas as a possible producer of rice. Experiments resulted so satisfactorily, that in 1905 Louisiana had ceased to raise so enormous a percentage of the American crop. Though Texas before 1900 grew practically no rice, in 1909 it raised 9,894,000 bushels as against Louisiana's 12,675,000. The total crop of the United States that year was 24,368,000 bushels, worth $12,955,748. South Carolina raised 476,792 bushels; Arkansas 1,120,000; Georgia 100,000; Florida 25,000; Alabama 35,000; Mississippi 30,000; and North Carolina 13,000. (Total 24,368,000 bushels, including the yield from Louisiana and Texas.)

American rice-fields consist of reclaimed cypress-swamps and tidewater lands along the coast or of marshes higher up the rivers or in the interior upon level tracts, if these are so situated that they can be easily irrigated. The plant needs high temperature in summer and plenty of water, the amount depending on the strength of the plant and its state of growth. The seed, when planted, is wet thoroughly in order to make sure that it will sprout. When the plant appears, the soil is flooded four or five inches, the water standing till the leaves float. Then it is drawn off, the soil cultivated, and the plant allowed to take firm root. Then it is flooded again, the water staying till the rice is ripe. In order to protect tidal lands against salt-water, which would kill the rice, they are surrounded with dikes which prevent the tide from reaching them and freshets from flooding them.

Rich'ard I of England, surnamed the Lion-Heart, was born at Oxford, Sept. 8, 1157, and by the death of his father, Henry II, became king on July 6, 1189. Being a born soldier and thirsting for military glory, soon after his coronation Richard raised a large force of soldiers with which he joined the third crusade, then about to leave Europe for the Holy Land. He united his forces with those of Philip, king of France, at Vezelai; but at Lyons the two armies, numbering in all about 100,000 men, separated and proceeded by different routes to Sicily, where they again met. Here Richard betrothed Arthur, his nephew, to the infant daughter of Tancred, king of Sicily, with whom he formed a close alliance. On June 4, 1191, Richard reached the camp of the crusaders, then assembled near Acre, and shortly afterward that stronghold surrendered, the siege having lasted two years. Richard's march to Joppa along the seashore, his advance upon Jerusalem at Christmas, his capture of the fortresses in the south of Palestine, his second advance upon Jerusalem (the city he never beheld),

his relief of Joppa — these and other deeds gave him a great name for heroism and valor, but brought no decisive advantage to the crusade. On Richard's way home in 1193 he was shipwrecked in the Adriatic. Wandering in disguise through the dominions of his enemy, the archduke of Austria, he was recognized, seized and handed over to Emperor Henry VI. Being ransomed by his loyal subjects, Richard returned home the next year, and almost immediately afterwards engaged in war with Philip of France, in which he was killed by an arrow shot from the castle of Chaluz, near Limoges, April 6, 1199.

Richard II of England, second son of the Black Prince and Joanna of Kent, was born at Bordeaux, April 13, 1366, and succeeded to the throne on the death of his grandfather, Edward III, June 28, 1377. His reign is an interesting epoch of English history, as the newly-established house of commons was eager to claim a share of political power and the laboring classes were seeking to be freed from the bondage under which they had so long suffered. During the first years of Richard's reign — he being only 11 when he came to the throne — the government was intrusted to a council of 12. Although John of Gaunt, the king's uncle, was nominally excluded from this council, he was generally regarded as the real head of the government and was held responsible for the heavy taxation and other abuses of which the nation complained. In the midst of the conflicts of contending factions and after several impeachments and executions Richard in 1389 declared himself of age and took the government into his own hands. For several years the country enjoyed peace and a fair degree of prosperity, until the king became involved in quarrels with the earls of Warwick, Arundel and others. Warwick was banished and Arundel beheaded, but Richard, after having triumphed over his enemies, began to quarrel with his friends. A misunderstanding having arisen between the duke of Norfolk and Henry, duke of Lancaster, Richard sent the former into banishment for life and the latter for ten years. But on Richard's return from an expedition into Ireland in 1399, he found that Lancaster had landed in England and raised a large army during his absence, with which he was marching to London; moreover, the army which Richard had taken into Ireland no sooner landed in England than it almost entirely deserted him and passed over to the invader. Richard met Lancaster at Flint Castle, where he formally resigned his crown and was carried captive to London and placed in the Tower. A month later Lancaster was proclaimed king as Henry IV, and Richard was condemned to imprisonment for life. In the following February Richard's body, or what was supposed to be his body, was brought from Pontefract Castle and shown to the public. According to some accounts, he was murdered in the castle in February, 1400; according to others, he escaped to Scotland and died there a lunatic.

Richard III of England, was the youngest son of Richard, Duke of York, and the great-grandson of Edmund, Duke of York, the fifth son of Edward III. He was born at Fotheringay, Oct. 2, 1452. On the defeat and death of their father in 1460, he and his brother George, afterwards duke of Clarence, were sent by their mother to Utrecht, where they remained until the crown was won from Henry VI by Edward IV, their older brother. In 1471 Richard led the van of his brother's army at Barnet, and took an active part in the decisive victory at Tewkesbury. It is claimed that after the battle he and Clarence murdered Prince Edward, son of Henry VI, and in some quarters it is believed that he was concerned in the murder of Henry himself in the Tower. Edward IV died on April 9, 1483, leaving Richard guardian of his son, Edward V, only 13 years of age; but, instead of faithfully fulfilling this trust, Richard placed the boy and his younger brother in the Tower and had himself proclaimed king. Not content with thus depriving young Edward of his crown, Richard caused him and his brother to be murdered while they were in the Tower, hoping thereby to make his own power the more secure. But Richard's numerous crimes made him so unpopular, that when Henry Tudor, Earl of Richmond, arrived in England with an invading force in 1485, he soon raised such an army that at the battle of Bosworth Richard lost both his crown and his life (August 22), and was succeeded by his antagonist as Henry VII.

Rich'ardson, Samuel, a famous English novelist, was born in Derbyshire in 1689, and died at London, July 4, 1761. He says of himself that he had only "common-school learning," and at 16 he was bound to a printer, with whom he served the usual period of apprenticeship. After working as a journeyman-printer for years, in 1719 he set up an establishment of his own, in which he attained a fair degree of prosperity. In November, 1740, when Richardson was over 50, he published his first novel: *Pamela or Virtue Rewarded.* So popular was this book that a second edition was published in February following, a third in March and a fourth in May. Eight years later appeared the work which is generally considered Richardson's masterpiece: *The History of Clarissa Harlowe.* Dr. Johnson declared this book to be the first in the world for its knowledge of the human heart: and Fielding says of it: "Such simplicity, such manners, such deep

penetration into nature, such power to raise and alarm the passions, few writers, either ancient or modern, have been possessed of." Having drawn the ideal woman in Clarissa, Richarson proceeded a few years afterward to portray in Sir Charles Grandison the perfect man, "the man of true honor." *The History of Sir Charles Grandison* is considered a work of great ability, but not equal to *Clarissa*. Perhaps the most striking proof of Richardson's native genius is found in the facts that his method of telling a story by correspondence and his extreme diffuseness, either of which would be fatal to most writers, seem to give him only a firmer hold upon his readers and to increase and intensify the reality of his creations. See the essay of Mrs. Oliphant (*Blackwood's Magazine*, March, 1869).

Richelieu (*rĕsh'lyē*), **Armand Jean du Plessis,** Cardinal Duc de, was born at Paris, Sept. 5, 1585, and was educated for the military profession at the Collège de Navarre. In 1607 he was consecrated bishop of Luçon, and for some time devoted himself to the duties of his diocese; but, when a rupture occurred between King Louis XIII and the queen-mother some years later, Richelieu was very active in securing a reconciliation between them, thereby laying the foundation of the great influence he afterwards exercised. In 1622 Richelieu was made cardinal, and in 1624 became minister of state, a position which, in spite of all opposition, he held until the end of his life. At one time the king had determined on dismissing him, but in an interview Richelieu so worked upon the weakness and fear of the monarch, that his supremacy was fully established from that day. Several important results attended Richelieu's administration of French affairs. The most important was the establishment of the absolute authority of the king, which during the feudal period was much abridged by the power of the nobility. By vigorous and often cruel and unscrupulous measures Richelieu broke down all the great nobles who opposed him, some of whom he brought to the scaffold, and sentenced others to lifelong imprisonment. When he died, there was scarcely any check upon the exercise of the king's prerogative. Another of his great enterprises was the overthrow of the Huguenot party as a political power, which he completely effected by the siege and capture of Rochelle in 1628. At the same time he secured for the Huguenots a measure of toleration; and, on the whole, he used his success in this conflict with great moderation. In his foreign policy, the chief object of which was to humble the power of Austria, he was equally successful. With this great end in view he allied himself with the German Protestants and even with the great champion of the Protestant cause, Gustavus Adolphus of Sweden. He died at Paris, while at the height of his power and authority, Dec. 4, 1642. See *Le Cardinal Richelieu* by Dussieux.

Rich'mond, Ind., a city on the east fork of Whitewater River, 70 miles by rail from Cincinnati and about the same distance from Indianapolis. It was founded by the Society of Friends, who established Earlham College (coeducational) here in 1859. The public-school system is excellent. The city manufactures agricultural implements, pianos and automobiles. Population, 23,932.

Richmond, Va., capital of Virginia and county-seat of Henrico County, is situated on the left bank of James River, about 150 miles from its mouth and 115 from Washington. The James supplies immense water-power; and the city contains nearly 1,000 manufacturing establishments, with a capital amounting to many million dollars. The chief of these are tobacco-factories, rolling-mills, iron-foundries, wagon and carriage works, lumber-mills and a railroad-car factory. In 1861 Richmond was selected as the capital of the southern Confederacy, and throughout the war was the objective point for all the aggressive movements of the eastern army of the Union, until the seizure of its lines of supply by General Grant compelled evacuation by General Lee on the night of April 2, 1865. A portion of the city was burned by the retreating Confederates; but the city has more than recovered her former beauty and prosperity. Her capitol was built after a model procured by Jefferson when in France, which was patterned after an ancient Roman temple. In its rotunda is a marble statue of Washington, taken from life. The city has an admirable public-school system and institutions of learning among them Virginia Mechanics' Institute, Richmond Female Seminary (P. E.), Hartshorn Memorial College (Baptist) for colored girls, St. Peter's Academy and Visitation Academy (R. C.), the Medical College of Virginia and University College of Medicine. Richmond has five public libraries, numerous beautiful churches, charitable institutions and hospitals. Population 127,628.

Richmond, Leigh, English clergyman, author of *The Dairyman's Daughter*, was born at Liverpool, Jan. 29, 1772, and while a child was lamed for life by leaping from a wall. He studied at Trinity College, Cambridge, and after filling the joint curacies of Brading and Yaverland in the Isle of Wight for a number of years, in 1805 he was appointed to the rectory of Turvey, Bedfordshire, where he died on May 8, 1827. Besides *The Dairyman's Daughter* he wrote *The Negro Servant* and *The Young Cottager*. The three tracts have carried his name over the civilized world. Collected, they form *The Annals of the Poor*.

Richter (*rĭk'tẽr*), **Jean Paul Friedrich** (usually known by his pseudonym of Jean Paul), was born on March 21, 1763, at Wun-

siedel in northern Bavaria, and, after attending school in Hof for a number of years, was sent to Leipsic to study theology. But Rousseau, Voltaire and other authors had much greater attractions than did theology, and he, too, resolved to write books. His first literary efforts were satires, but he could get no publisher, and for years he carried on a desperate struggle against poverty, continuing to read and study with actual hunger as his daily companion. In 1785 he left Leipsic to avoid imprisonment for debt, and took refuge with his widowed mother at Hof. Here his circumstances were made a little easier, and he spent a number of years as private tutor in wealthy families. For a long time Richter seemed destined to failure as a writer, but in 1793 there was a turning point in his fortune, *The Invisible Lodge* proving unexpectedly successful. It was followed by other works which brought him a liberal pecuniary reward and gave him high rank among the literary men of his age. In 1801 Richter married and settled at Baireuth, where he spent the remainder of his days. The principal works written during his married life were *Titan* and *Wild Oats*, the former accounted by himself and most German critics his masterpiece. Jean Paul perhaps is the most unique character in German literature, the chief of humorists and, in the language of Carlyle, "a colossal spirit, a lofty and original thinker, a genuine poet [in prose], a high-minded, true and most amiable man." He died at Baireuth, Nov. 14, 1825. See *Life of Jean Paul F. Richter* by De Quincey.

Rick'etts, James B., an American general, was born at New York in 1816, and graduated at West Point in 1839. He served in various kinds of frontier duty and in the Mexican War until the Civil War broke out, in 1861, when he was made brigadier-general of volunteers, and continued in active service with the army of the Potomac until the close of the struggle. Among the battles in which he participated were Bull Run, South Mountain, Antietam, the Wilderness and the siege of Petersburg. He retired with the rank of major-general, Jan. 3, 1867, and died at Washington, D. C., Sept. 22, 1887.

Rid'dles may be defined as questions or propositions containing a more or less hidden meaning, which is to be discovered by guessing. At the present day propounding and solving riddles are a mere pastime, but in ancient times they were put to more important purposes, being used to some extent for practical instruction and intellectual discipline. Every reader of the Old Testament is familiar with the riddles which Samson proposed to the Philistines. They first came into use in Greece about the time of the Seven Wise Men, one of whom was celebrated for the composition of metrical riddles. The riddle was much cultivated in Europe during the middle ages, although it was an amusement rather than an intellectual exercise. Abbé Cotin published a collection of his own riddles and those of his contemporaries, in which he styled himself *Le Père de l' Enigme* (the father of the riddle), but his claim has not been recognized.

Rid'ley College is an Anglican church-school for boys near St. Catherines, Ontario. It was founded in 1889 by men, under the presidency of the late Thomas R. Merritt, who wished to have a place where their boys might be educated on the lines of the famous English public schools. There are two schools, the upper one for grown boys and the lower one for children. Each has an independent headmaster and independent staff. The buildings accommodate 140 boys; and the school is so popular that applications for entrance have to be made some time in advance. Principal J. O. Miller, D. D., has been in charge since inception. Ridley was the first large residential school to establish entirely separate buildings, grounds and staff for junior boys.

Ridley, Nicholas, Protestant martyr, was born at Wilmontswick, Northumberland, about 1500, and, after graduating at Pembroke Hall, Cambridge, in 1522, was ordained priest in 1524. He next went to Paris and to Louvain, and, having met some of the most active reformers while abroad, after a three years' absence he returned to England an ardent believer in the doctrines of the Reformation, quickly making himself one of the foremost leaders of the church. In 1547 he was made bishop of Rochester, and, when Bonner was deposed from his position as bishop of London, Ridley was appointed his successor. He assisted Cranmer in the preparation of the 41 articles, afterward reduced to 39. After the death of Edward VI Ridley espoused the cause of Lady Jane Grey, even going so far as to preach a sermon in which he declared both Mary and Elizabeth illegitimate. For this offense he was stripped of his office and dignities and committed to the Tower. In March, 1554, he was taken to Oxford to be tried by a commission, named by Cardinal Pole, for heresy, and, after being kept in prison for 18 months and resisting all influences to make him recant his views, he was burned at the stake in front of Balliol College on Oct. 16, 1555. See *Life* by Dr. Gloucester Ridley.

Riel, Louis, was the leading figure of the Red River Rebellion (*q. v.*). His father was white, his mother a half-breed. He had been educated for the priesthood in Montreal. Eloquent, magnetic, vain, he resisted the rule of the Dominion. Archbishop Taché was in Rome at the time. Riel seized Fort Garry and set up a provisional government. This caused the expedition under Sir Garnet Wolseley. As the expedition approached, Riel fled and found a refuge in the United States. Subsequently he was tried for treason, convicted, and executed in 1885.

Rienzi (*rē-ĕn'zē*), **Niccolò Gabrini di**, generally called Cola di Rienzi, was born at Rome in 1313. His advantages of education were excellent, and nature had bestowed a marvelous gift of eloquence. The assassination of his younger brother by a Roman noble whom he found it impossible to bring to punishment aroused his feelings against the aristocratic families, and he determined, if possible, to destroy their power and overthrow them. In 1343, in company with Petrarch and others, he visited the papal court at Avignon to induce Clement VI to return to Rome and protect the citizens from their oppressors. Rienzi returned in 1344, and for three years loudly and openly threatened the nobles with revolution. At last he summoned the citizens, and, surrounded by the pope's legate and a number of trusted confederates and followed by 100 horsemen, he proceeded to the capitol, where he assumed the title of tribune and was invested with complete dictatorial power. The pope confirmed Rienzi in his authority; all Italy rejoiced in his success; and many predicted a revival of the power and majesty of the Eternal City. But the nobles were bitterly hostile; and, although Rienzi won a great victory over them when they attempted to rise against him, the pomp and luxury which he sought to maintain involved him in such expense that he was compelled to levy heavy taxes. These aroused so much opposition that, after a reign of seven months, he fled to Naples. After two years among the Franciscans in the Apennines, he went to Prague to secure the support of Emperor Charles IV in another effort to deliver Rome. Charles, however, was so amazed at his schemes that he sent him a prisoner to the pope at Avignon, but by the mediation of Petrarch he was released. Innocent VI resolved to use Rienzi as a means of crushing the Roman nobles, and accordingly sent him to Rome in the train of Cardinal Albornoz. Their object was speedily accomplished, and Rienzi, having borrowed money and raised a body of soldiers, made a triumphal entry into Rome and was received with universal acclamation. But adversity had soured Rienzi's temper without teaching wisdom and moderation. The same defects that had characterized his former administration revealed themselves. In two months the opposition became so great that he was assassinated at the foot of the capitol stairs, his head being cut off and his body subjected to the greatest indignities (Oct. 8, 1354). His story has been made the basis of a thrilling romance by Bulwer. See the histories of mediæval Rome by Gregorovius, Reumont and Villari.

Ri'fles were invented for securing more accurate firing of bullets than was possible with the smoothbore gun. As the ball never fitted tightly in the smoothbore, it was, in its irregular motion along the barrel, pressed now against one side and now against the other, and therefore its direction after discharge was not determined by the line of the barrel, but by the particular point of the muzzle with which it happened to be in contact at the instant of discharge. The spiral groove, when the bullet fits into the grooves, causes the bullet to revolve on its axis with a rapidity in proportion to the force of the explosion and the sharpness of the twist in the spiral. During the War of 1812 the American army demonstrated the value of rifles in war; but many years were to elapse before they were generally placed in the hands of soldiers.

In 1837 a rifle invented by Captain Delvigne was issued to a few regiments in the French army, and four years afterward the Prussians equipped their entire army with the celebrated needle-gun, which proved its superiority over all rifles previously invented. The next step in advance was the rifle invented in 1849 by Captain Minie of the French army, in which the spherical bullet was discarded and its place supplied by one in the form of a cylinder with a conical point. Notwithstanding all the advantages of the minie gun, it was found too heavy for effective service; and in 1853 the British Enfield rifle was invented, in which, besides other improvements, the diameter of the bore was reduced about an eighth of an inch. This diminished the weight of the gun very materially without impairing its force or accuracy. In 1855 the United States adopted what was known as the Springfield rifle, of which the caliber was .58 inches, the bullet, which was cylindro-conical in form, weighing 500 grains and the powder-charge 60 grains. During the Civil War it became necessary to issue Enfield and other rifles to the regiments, but the Springfield, with its various improvements, continued to be the standard arm of the United States. The magazine-rifle is a rifle that stores the cartridges in the stock or above the trigger, and automatically feeds them into the breech. Pulling the trigger operates the magazine so long as the supply lasts. The bullet has great penetrating power.

Owing to the accuracy and deadliness of modern rifles and field pieces soldiers stand farther apart in warfare than formerly. The battles in the European War were distinguished by lines a hundred miles or more in length—truly a "far-flung battle line." This is due not only to the large number of men engaged but because owing to the range and accuracy of the weapons and the velocity of the projectile the men must be more widely distributed. This was one of the lessons of the Russo-Japanese War (*q. v.*). At Yalu 40,000 men were drawn out in a line five miles long—exactly the same front occupied by 180,000 Germans at Gravelotte in the Franco-German War (*q. v.*).

German rifles throw a bullet forward at the rate of 2,952 feet—more than half a mile—a second and in that respect excell any military rifle in the world. The French rifle has a longer range by a quarter of a mile.

As the Americans were the first to demonstrate the value of rifles in war so it is curious to note that in the European War the method of fighting went back to pioneer days in America—every bush, tree, stone, mound or hillock being used as a shield. Where the ground was level, and time, when permitted, artificial protection was made by digging trenches. Trenches developed into underground homes—reminding one of the days of the cave dwellers. These proved far more effective than fortifications (*q. v.*) of stone such as the magnificent ones at Antwerp which fell so quickly before the guns of the Germans.

As a result of the wider distribution of men and these methods of protection astonishingly few men were killed in the European War in proportion to the shots fired, as compared with previous wars. The conditions, however, put a much severer strain on the soldiers as it is much harder on the nerves to hide and be shot at than to fight in the open field or in hand to hand conflicts, such as those that took place when Xerxes invaded Greece or when Hannibal crossed the Alps. Nowadays a man is more apt to be killed by a man whom he has never seen—a feature of modern warfare which emphasizes the pity of it as expressed so eloquently by Herr Teufelsdrockh in the famous passage in Carlyle's *Sartor Resartus* about good, kind-hearted men who have no quarrel of their own being drawn up to "blow the souls out of one another" to adjust a boundary line.

Those little, crooked lines on our maps that define the boundaries of the world have—so many of them—been made in just that way. See *Treatise on Small Arms and Ammunition* by Lieutenant-Colonel Bond, R. A. Andrew Lang's *Homer and His Age*, tells many curious things about the armor of the ancient Greeks, and—you may be sure—tells it in a most interesting way. See ARMS.

Riga (*rē'gä*), capital of Livonia and the third seaport of Russia, lies on Dwina River, seven miles from its mouth and 350 miles from Petrograd. The old town has narrow streets and medieval houses and stores; but the suburbs are laid out in broad streets with handsome buildings. Manufactures are numerous and varied and employ several thousand people. Riga was founded in 1201 by Albert, bishop of Livonia, and soon became a first-rate commercial town and a member of the Hanseatic League. It belonged to Poland from 1561 till it was taken by Gustavus Adolphus in 1621, and in 1710 it was finally annexed to Russia. Population 318,400.

Riggs, Kate Douglas (Wiggin), American author, was born in Philadelphia, Sept. 28, 1857. She graduated from Abbott Academy at Andover, Mass., and made her home in California, where she was the first to organize free kindergartens. She came into prominence as the author of *The Birds' Christmas Carol*, and her reputation as a writer of clever and well-told tales has never waned. Among her best-known stories are *The Story of Patsy, A Cathedral Courtship, The Diary of a Goose-Girl* and *Rebecca of Sunny-Brook Farm.* In 1895 she became the wife of G. C. Riggs, but still retains her maiden name of Wiggin as her pen-name.

Rigoletto, an opera in three acts. Words by Piave. Music by Giuseppe Verdi (1813-1901). The libretto is adapted from a drama of Victor Hugo's, and appeared first under the title *La Maledizione.* It possessed the necessary elements of interest for the hearer, and was so well-treated musically by Verdi as to give him world-wide fame. The first production of the opera occurred at Venice, March 11, 1851. It was not allowed on the stage, however, until such alterations had been made in the story as satisfied the government, who sanctioned the revision under its present title of *Rigoletto.*

Riis (*rēs*), **Jacob Augustus,** reporter, reformer, journalist and author, was born at Ribe, Denmark, in 1849. Having completed his course at Ribe Latin School, he came to the United States in 1870 and settled in New York City. After a few years of varied experience he became editor of *The South Brooklyn News*, which he afterwards bought and for a time managed. In 1877 he became a police-reporter for *The New York Tribune*, subsequently for *The New York Sun.* He soon became prominent in tenement-house and school reforms in lower New York City, and was active in the movement that led to the establishment of small parks in that section. In 1896 he was made executive officer of the Good-Government Clubs, and secretary of the New York Small-Parks Commission in 1897. He was frequently heard on the lecture-platform, contributed extensively to magazines, and is the author of a number of well-known and widely read books, of which the following is a list: *How the Other Half Lives* (result of study of the poor), *The Children of the Poor, Nibsy's Christmas, Is there a Santa Claus? Children of the Tenements, Out of Mulberry Street, Ten Years' War, The Making of an American, The Battle of the Slum* (a sequel to *How the Other Half Lives*), *The Peril and the Preservation of the Home, Theodore Roosevelt the Citizen* and *The Making of an American* (autobiography). He died in 1914.

Ri'ley, James Whitcomb, American author, familiarly known as the Hoosier poet, was born at Greenfield, Ind., in 1853. After a desultory education he began contributing verse of a dialect character to the newspapers, not a little of which, though simple and at times prosaic, is tender and touching. The success of his work led to reciting his poems in public, chiefly those in the Hoosier dialect, caught and utilized as a re-

membrance of his early life on a farm He died July 22, 1916. Among his best-known productions are *The Old Swimmin' Hole, Green Fields and Running Brooks, Old Fashioned Roses, A Child-World, Pipes o' Pan at Zekesbury, An Old Sweetheart of Mine, Rubaiyat of Doc Sifers, The Book of Joyous Children, Songs o' Cheer* and *While the Heart Beats Young.*

J. WHITCOMB RILEY

Rimini (*rē'mē-nē*), a city of Italy, on the shore of the Adriatic, 70 miles from Bologna; it is still surrounded by walls, and contains many mediæval buildings. The spot where Cæsar stood to address his soldiers, after crossing the Rubicon (about ten miles northwest of Rimini), is marked on one of the squares by a monumental pillar, and beside one of the gates stands the triumphal arch, 46 feet high, erected in honor of Augustus. Population 43,590.

Rine'hart, William H., an American sculptor, was born in Frederick County, Md., Sept. 13, 1825. He received only a common-school education, and at 21 apprenticed himself to a marble-worker in Baltimore. So great was his interest in his trade and so close his attention to his duties, that in two years he was put at the head of the ornamental work. In 1855 he went to Italy with the determination to be a sculptor, and after two years' instruction and practice in Florence he brought back two bas-reliefs of such unquestioned merit, that no critic could fail to recognize his artistic talent. After remaining in Baltimore about a year, he went to Rome, where he continued until his death, his orders for portrait-busts becoming so numerous that he generally had one or two years' work ahead. A bronze statue of the late Chief Justice Taney, made by Rinehart under a commission from Maryland, was unveiled in Annapolis in 1872. Among his greatest works are the *Angel of the Resurrection, Woman of Samaria* and *Clytie.* This was on exhibition in Peabody Institute of Baltimore. He died at Rome, Oct. 28, 1874, leaving $45,000 as a fund for the aid of indigent students of art.

Rio de Jane'iro (*rē'ō dā zhà-nā'rō*), capital of Brazil, stands on the western side of one of the finest natural harbors in the world. The city and its suburbs stretch nearly ten miles along the shore, while great mountain-ranges shut in the background. About three miles southwest stands the precipitous cone of Corcovado, up which a cog-railway carries 100,000 visitors every year to enjoy the magnificent view of land and sea. The city is the commercial as well as political capital of Brazil, sending more than half of its exports and bringing in 45 per cent. of

the imports. The exports of Brazil in 1910 amounted to £75,465,109, the greater portion of this amount being derived from coffee. Manganese ores are largely exported from Bahia and Rio de Janeiro. At Rio, besides large flour-mills, there are important woolen factories of cloths, felts, flannels and rugs. In January of 1531 Alphonso de Sousa, a Portuguese captain, entered the bay, and, thinking it the mouth of a large river, named it Rio de Janerio—that is, January River; but the city was not founded until 1536. Its population, including many foreigners, is about 1,000,000. The state of Rio de Janeiro has an area of 26,634 square miles, and population of 926,035. Rio de Janeiro is represented in the Brazilian Congress (chamber of deputies) by 17 deputies. In 1903-04 military interference in the states of the republic led to a naval revolt in the Bay of Rio de Janeiro, which was suppressed later. See BRAZIL.

Rio Gran'de, a large river of North America, rises in San Juan Mountains in Colorado and flows southeastward, forming the boundary between Texas and Mexico, its length being about 1,800 miles. For the most part it is a shallow stream, but steamboats can ascend it for nearly 500 miles. Its chief tributary is the Rio Pecos.

Rio Negro (*rē'ō nā'grō*), one of the principal affluents of the Amazon, rises as the Guiana in southeastern Colombia, and flows east into Venezuela, south into Amazonas in Brazil and again east and southeast until it joins the Amazon at Manaos, after a course estimated at 1,350

miles. It is over a mile broad when its clean, inky-black stream enters the yellow, muddy Amazon.

Rip'ley, George, was born at Greenfield, Mass., Oct. 3, 1802. After graduating at Harvard College in 1823, he studied theology there and was ordained to the pastorate of a Unitarian church at Boston. This he held until 1841. In the meantime he had become one of the leading spirits in the Transcendental movement, the first meeting of the club being held at his house in 1836; and on leaving the pulpit he started the Brook Farm experiment. This ended in 1847, when Ripley removed to New York City and engaged in literary and journalistic work. He died on July 4, 1880. See *Life* by O. B. Frothingham in the American Men of Letters Series.

Rip Van Win'kle, the hero of Washington Irving's delightful sketch, first published in 1820, is an idle, good-natured, henpecked scapegrace, who, with his gun and dog, seeks a refuge from the scolding of his sorely tried and ill-tempered wife in the forests of the Catskill Mountains. There he falls in with Hendrik Hudson and his crew of *The Half-Moon*, who are playing at ninepins in a secluded hollow, the balls sounding like peals of thunder along the sides of the mountain. Rip is directed to wait on them, and while in this service drinks of their liquor until his senses forsake him and he falls asleep. He wakens on a bright summer morning 20 years afterward, to find his dog gone and a rusty firelock by his side. When he returns to his native village, he sees new buildings and new faces on the street. His own house has fallen into decay; his wife is dead; and he who went away a subject of George III has returned to find himself a citizen of the United States. This story has been dramatized, but no version has held the stage except the one with which the name of Joseph Jefferson has been identified.

Ristori (*rēs-tō'rē*), **Adelaide,** an Italian tragedian, was born on Jan. 29, 1821, at Cividale in Friuli. Her parents were strolling players, so that she may almost be said to have begun life in the theater. At 14 she took a part in *Francesca da Rimini*, and in a few years became the leading actress of Italy. After acting in her own country for years, she presented herself before a French audience in 1855 and won a complete triumph, and thereafter gained additional laurels in nearly every country in Europe, as also in the United States and South America. The *rôles* in which she especially shone were Mary Stuart, Media, Marie Antoinette and Lady Macbeth. She retired in 1885, and died on Oct. 9, 1906.

Ritschl, Albrecht, a German Protestant theologian, was born at Berlin, March 25, 1822, and died at Göttingen, March 20, 1889. Studying at Bonn and Halle, he became professor of theology at the former, but subsequently accepted the same chair at Göttingen, where he became a well-known exegete and the head of a school of theology bearing his name. Though he held that Christianity is a divine revelation, he held free views regarding inspiration, and was no believer in the supernatural. He rejected the doctrines of the trinity, incarnation, original sin and other orthodox religious beliefs, holding that the religious sense is the essential and ultimate fact in religion. Only a few of his published works are translated from the German. Of his works the chief are *The Christian Doctrine of Justification and Reconciliation*, *Theology and Metaphysics*, *History of Pietism*, *Instruction in Christian Religion* and *Origin of the Ancient Catholic Church*.

Rit'ter, Karl, an illustrious geographer, was born at Quedlinburg in Prussia, Aug. 7, 1779. After studying at Halle, he was nominated professor of geography at Berlin in 1820, and afterwards became member of the academy and director of studies of the military school. With Ritter as the founder of comparative geography began a new epoch in the history of geographical science. His chief work, *Geography in Its Relation to Nature and the History of Men*, was divided into (1) Central Asia, Siberia, China and India; (2) Western Asia; (3) Arabia; and (4) Sinai, Palestine and Syria. His lectures were published in *History of Geography; General Geography;* and *Europe*. He died at Berlin, Sept. 28, 1859, and his name is perpetuated in two geographical institutions at Berlin and Leipsic.

Riv'erside, Cal. city and county-seat of Riverside County, about 60 miles east of Los Angeles. The climate makes it especially attractive as a health-resort. The mission-style of architecture is used extensively in the public buildings. Noteworthy buildings in this style are the high school, Carnegie Library and Glenwood Hotel. The irrigation-system is one of the most extensive in southern California, and the yearly crop of citrus-fruit grown in the county fills more than 8,000 cars. There are nearly 40 packing-houses employing over 1,500 persons. Riverside is the seat of Sherman Institute, a United States Indian school, which has 600 pupils. Population 15,212.

Rives (*rēvz*), **Amelia** (known also as Mrs. J. Armstrong Chanler and as Princess Amélie Troubetzkoy), American novelist, was born at Richmond, Va., Aug. 23, 1863. Her earliest production was a series of stories entitled *A Brother to Dragons*, which showed imagination and a certain strength. This was followed by a sensational and passionate work called *The Quick and the Dead*, which met, however, with considerable popularity. Her later work embraces *Virginia of Virginia*,

Herod and Mariamne, According to St. John, Barbara Dering, Athelwold, Tanis and a number of magazine articles. In 1896, after being divorced from J. A. Chanler, her first husband, she married a Russian prince.

Riviera (*rē'vē-ā'rä*), ("seashore"), the narrow strip of coastland bordering the Gulf of Genoa. West of Genoa it is called Riviera di Ponente or the western coast and beyond Genoa Riviera di Levante or the eastern coast. The western section is the more frequented section, as it abounds in the most striking and beautiful scenery and has numerous health and fashion resorts.

Roads. Great roads must have been built by all ancient nations; but the oldest roads of which parts still remain are those of the Romans, who built them of huge, deep, stone blocks and concrete. The modern plan of broken-stone roads is, however, far superior. It takes its name from the Scottish engineer Macadam (*q. v.*). At the same time with Macadam (about the beginning of the 19th century) Telford, another Scottish engineer, adopted a similar plan; but used a base of stone set on edge, which is unnecessary, and had been long used in France. In macadamized roads a foundation of stone-blocks about six inches deep is surmounted by broken stone and covered with a thin layer of clay or other building material. Owing to the greater distances to be traversed, roads in the United States are very backward as compared with those of Europe. Roads at first were chiefly in the hands of turnpike companies who charged toll to passengers; but they are now locally constructed by the states and townships, a rate being levied on the property-holders who obtain the chief benefit. The repairing of roads is a source of great expense; it is best done by constant work of gangs of road-repairers who patch roads wherever needed. Each road has to be constructed with reference to shortness, ease of grade, hard and smooth surface and thorough drainage. The introduction of automobiles has created a loud call for "good roads" and increased attention is now given to road-improvement.

Roanoke (*rō'ä-nōk'*), a river of Virginia and North Carolina, formed by the junction of the Dan and Staunton Rivers, a mile above Clarksville, Va., flows southeast through North Carolina and empties into Albemarle Sound. Its length is a little over 200 miles, and it is navigable for steamboats from its mouth to Weldon, a distance of 130 miles.

Roanoke, Va., a city on Roanoke River, 257 miles west of Norfolk, at the junction of the Shenandoah-Valley division and the main line of the Norfolk and Western Railway. In 1881 it contained only 600 inhabitants, while the population by census of 1910 was 34,874, making it the third city in size in the state. The Norfolk and Western general offices and immense repair-shops are here, as well as extensive bridge-works, iron-furnaces and other manufacturing establishments. It also is a distributing point for wholesale houses of various descriptions, and is the gateway to the great coal-fields and timber-districts of Virginia and West Virginia. It is the junction-point for several divisions of the Norfolk and Western Railway, and is the only city of importance which is touched by the new Virginian railway, extending from Kanawha River to Chesapeake Bay.

Robbia, Luca della (*lōō'kä dĕl'yä rŏb'bēä*) born in Florence about 1400, was the first and greatest of the Robbias who flourished in Italy for nearly a century. Luca is most popularly known as the inventor of enamelled, colored terra-cotta rather than as a great sculptor only slightly inferior to Donatello and Ghiberti. The glazing of terra-cotta was an ancient art and had never fallen into disuse; but, while its use in architectural decoration was old, Luca was the first to apply it to sculpture in independent monumental form. It probably was his desire for color which prompted his investigations; and he was successful in finding a coating by which color was made durable as stone. Luca strove to obtain the effect of old polished marble or ivory; and it is said that for many years the secret of the process and immense technical knowledge and skill were closely kept in the Robbia family, and handed down as a legacy from generation to generation. Luca's work may be distinguished not only by its conception but by the soft creamy white of the figures, even opaque but luminous blue of his backgrounds and the careful fitting together of the sections. Luca's private life was uneventful. He was trained by a goldsmith, but soon asserted his preference for working in bronze and marble. He was intensely devoted to art and seems to have had few other interests except that the *Cantoria* and other works show a great knowledge of and feeling for music. He never married, but devoted his later years to the education of his nephews, of whom Andrea was the favorite.

At 30 Florence gave him the order for the most important work, his masterpiece, the marble *Cantoria* or singing-gallery executed for *Santa Maria del Fiore*, the Cathedral of Florence. There are ten marble reliefs representing youths and children and symbolizing music. It is a triumph of poetic conception, composition, science and skill. His best relief in glazed terra cotta is his *Resurrection* designed to fill the tympanum of the door of the *Sagrestia Nuova* beneath his own *Cantoria*. Luca's famous bronze doors are as great as his greatest sculptures. They are massive and severe, and retain in the design the character of strength and resisting power belonging to the purpose of the doors. His madonnas are lovely conceptions, and he is probably best known and

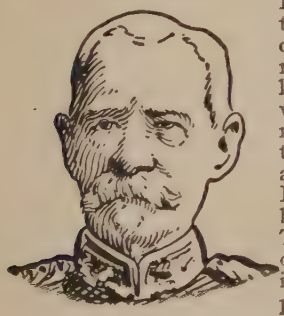
appreciated by the general public through these. He died in 1481 on the 20th of February.

Rob'ert I of Scotland (Robert the Bruce). See BRUCE, ROBERT.

Robert II of Scotland, 1371–90, was born on March 2, 1316, two years after the battle of Bannockburn. He lost both his parents in infancy, and throughout the disastrous reign of his uncle, David II, he was one of the most prominent nobles of Scotland, twice acting as regent during his exile and captivity. On David's death he obtained the crown, and became the founder of the Stuart dynasty. The wars which Robert waged with England were conducted by his barons, who shaped the policy of the kingdom according to their pleasure. The most noted features of Robert's reign were the invasions of Scotland by the duke of Lancaster ("old John of Gaunt") in 1384 and by Richard II in 1385 and the retaliatory expedition of the Scotch in 1388, which culminated in the battle of Otterburn. King Robert died in Ayrshire, April 19, 1390.

Robert III of Scotland, was born about 1340 and came to the throne on the death of his father, Robert II. His weakness and imbecility as ruler virtually placed the government in the hands of his brother, the Earl of Menteith. The chief events of Robert's reign were the invasion of Scotland by Henry IV of England in 1400 and the retaliatory expedition of Archibald Douglas, which resulted in the terrible disaster at Homildon Hill in Northumberland two years later. Robert died of grief on April 4. 1406, on learning that his son James had been taken prisoner by an English cruiser, while crossing the Channel on his way to France.

Roberts, Frederick Sleigh, Lord Roberts, Earl of Kandahar, Pretoria and Waterford.



LORD ROBERTS

In 1852 a diminutive English boy of 20 in the brand-new uniform of a lieutenant and with the erect carriage acquired in the military school at Sandhurst, England, embarked for India. The typical soldier, he was born in camp at Cawnpore, Sept. 30, 1832, and was bred for war. He was immediately nicknamed Little Bobs by the officers of his mess in affectionate raillery. He had the toughness and nervous alertness of a terrier. Quiet, keen, cool, a shrewd observer and personally popular, big soldiers were ashamed not to follow where "Little Bobs" led. He learned Hindustani so as to deal personally with native chiefs; telegraphy to be independent of operators. He trained himself to remain in the saddle 100 miles or 36 hours at a stretch. He had the geographical instinct that is invaluable to a soldier — he never got lost in the darkest night or the roughest country. For the rest, he never fell sick in the worst pest-holes of India, he was personally brave and proverbially lucky.

Employment for an officer so equipped was never lacking in India. Enlisted for ten years he remained forty-one. In '57, '67 and '78 there were wars — the Indian mutiny, the expedition into Abyssinia and the Afghan war. In each he distinguished himself and rose steadily in rank. In the siege of Delhi he was wounded, in the relief of Lucknow he won the Victoria Cross. The trouble in Afghanistan found him, at 40, a major-general and in command of the column that marched from Kabul to the relief of Kandahar. This march was made spectacular by the fact that the force was cut off from communication for a month, and lost to the world in the desert. "Little Bobs' " bump of locality brought his column through in safety. His generalship lifted the siege. He and his horse were decorated by Queen Victoria. As commander of the army of Burmah he remained in India until 1893. At 61 he was an earl, a member of the house of lords, and held the military rank of field-marshal. He retired to the honorary duties of commander of the army of Ireland, feeling that his active career was finished. He was in his 68th year when disasters to the army in South Africa in the Boer War of 1899 demanded his return to the front. It was in mourning that he went to Cape Town, for his only son and heir to his titles and estates had fallen at Colenso, after winning the Victoria Cross.

"Little Bobs is at the helm at last" was the cry of relief from all England. His grasp of the complicated situation was immediate and masterly, and his activity and energy shamed officers 20 years his junior. He inspected guns and stores and troopships, visited prison-camps and hospitals, laid out transport-lines and planned every detail of a campaign along a 1,000-mile front of hostilities. He quickly brought order out of chaos, posted every man to the best advantage, and led the main column of the army of invasion. The march to Pretoria may be compared, in its intention and results, with Sherman's march to the sea. He struck at Cronjé entrenched at Kimberly, captured Bloemfontein, capital of Orange Free State, compelled the Boers to abandon the siege of Ladysmith, divided and demoralized the forces of the enemy, ignored the guerilla chief — De Wet — and bluffed his way on scant rations into Pretoria and so turned defeat into victory. But for "Little Bobs" South Africa would probably have been lost and Great Britain's hold

on all her colonies weakened. He returned to England to succeed Lord Wolseley as commander-in-chief of the army. He died of pneumonia, Nov. 14, 1914, while on a tour of inspection of the British forces in France. His life may be traced in his military autobiography: *Forty-One Years in India* and in Winston Churchill's *Story of the Boer War*.

Rob'ertson, Frederick William, a celebrated minister of the Church of England, was born at London, Feb. 3, 1816. He matriculated at Brasenose College, Oxford, in 1837, and while there ardently devoted himself to the study of the Scriptures and standard literary works. In 1847 Robertson was called to Trinity Chapel, Brighton, where in a ministry of six years he arrested the public attention by originality, beauty and freshness of thought, wide human sympathy, knowledge of the human heart and interest in everything pertaining to human welfare. He showed his friendship for the working-classes by establishing the Workingmen's Institute at Brighton and preaching to its members the duty of culture and self-control. During Robertson's last years he suffered from a disease of the brain, which was aggravated by the misrepresentations to which he was subject on account of his liberal theological views and his sympathy for the laboring-classes. He died at Brighton, Aug. 15, 1853. See the *Life and Letters* and *Sermons*.

Robespierre (*rō'bes-pēr'*), **Maximilien Marie Isidore,** was born at Arras, France, May 6, 1758. After pursuing a course of study at the college of his native town, he was sent to complete his education at the College of Louis le Grand at Paris. On the convocation of the states-general in 1789, he was elected one of the deputies and went to Versailles; and here observers noted a peculiar force and earnestness that gave promise of a distinguished career. "This man," said Mirabeau, "will go far, for he believes every word he says." After the death of Mirabeau Robespierre's importance seemed to increase, and from this time forward his biography is a history of the French Revolution. Robespierre was one of the deputies to the national convention, which was formed in 1792, and as chief of the extreme party, called The Mountain, he was one of the main agents in procuring the execution of the king, which took place in December of that year. In the following year occurred his final struggle with the Girondists, many of whom he sent to the scaffold during the Reign of Terror that lasted for many months. Marie Antoinette and the Duke of Orleans were the first victims; Danton, Camille and others followed; and under the so-called committee of public safety Paris became the scene of an indiscriminate slaughter, in which thousands of lives were sacrificed. "Robespierre will follow me; I drag down Robespierre" said Danton on the scaffold. The end of the tyrant — such was the name given to him — drew rapidly near. A conspiracy was organized against him, and after a fierce tumult in the convention he was arrested. Next day (July 28, 1794), in company with Couthon, Saint-Just and 19 others, he closed his career on the scaffold. See the histories of the Revolution by Lamartine and by Taine.

Rob'in, the commonest of the American thrushes, ranging in summer from Mexico to Labrador and Alaska. In winter it is found from Virginia south. It is among the first migratory birds to arrive north of its winter limit. This bird is a near relative of the English blackbird. It is about ten inches long, with head and tail blackish and the rest of the upper parts olive-gray. The color of the under parts is chestnut-brown, except the throat, which is white with black streaks. The breast of the young robin is spotted. Its habits are too well-known to require description. The robin of England and Europe is an entirely different bird, belonging to the family of warblers. See REDBREAST.

ROBIN

Rob Roy, the popular name for Robert McGregor, a celebrated Scottish outlaw, whose singular adventures entitle him to be considered the Robin Hood of Scotland. Rob Roy borrowed money from the Duke of Montrose to engage in cattle speculation; but, as he met with heavy losses, his estates were seized by the duke on account of the debt. Being rendered desperate by his misfortunes, he collected a band of about 20 followers and made open war on the duke, robbing him of his cattle and preventing him from receiving the rents of his tenants. Many stories are still current in the neighborhood of Lochs Lomond and Katrine of his narrow escapes from capture by the troops that were sent after him. Many instances have also been recorded of his kindness and liberality to the poor, whose wants he often supplied at the expense of the rich. He died in his own house on Dec. 28, 1738, his funeral being attended by all the people of the district, except the partisans of the Duke of Montrose. Rob Roy's exploits have been immortalized in Scott's novel which bears his name.

Rochambeau (*rŏ'shăm-bō'*), **Jean Baptiste Donatien de Vimeure,** Comte de, a French marshal, was born at Vendome, July 1, 1725, and entered the army in 1742. In 1780 he was sent to America in command of 6,000 men to assist the colonies in their war for independence, and rendered effective assistance to Washington at the siege of Yorktown, the surrender of which by Cornwallis brought the war to a close. During the French Revolution he was imprisoned at the Terror (1798), and was saved from the scaffold only by the death of Robespierre. He became a marshal in 1791, and in 1804 Napoleon made him a grand officer of the Legion of Honor. He died on May 10, 1807.

Rochefort (*rôsh-fôr'*), **Victor Henri,** Comte de, French journalist, playright and Radical politician, was born at Paris, Jan. 30, 1830, a descendent of the old French nobility. He was noted for his repeated attacks in his newspapers upon men and governments, which again and again compelled him to quit France. He died in 1913.

Rochelle (*rō-shĕl'*). **La,** a seaport of France. Its harbor is still sheltered by the remains of Richelieu's famous dike and is surrounded by fine quays, close to which lie the principal streets and squares. Many of the latter are regular and well-built, and present a handsome appearance from the number of houses adorned with porticoes and balconies. Rochelle, which was known until the 12th century under its Latin name of *Rupella* or Little Rock, of which its present name is a mere translation, was settled by a colony of serfs of Lower Poitou, who, fleeing from the persecutions of their lord, settled on the rocky promontory between the ocean and the neighboring marshes. A stronghold of the Huguenots, it was unsuccessfully besieged in 1573, and in 1627–8 it offered 14 months' resistance to the forces sent against it by Cardinal Richelieu, but was at length compelled to surrender. To-day it is a fortress of France of the second class Population 31,559.

Roch'ester, N. H., city in Strafford County, on Salmon Falls and Cocheco Rivers about 30 miles from Concord. Its chief manufacturing establishments are shoe-factories, woolen-mills, brick-works and box-factories, while it also has smaller factories. The city has public and parochial schools, private commercial schools, a public library, several churches, and Gaffney Home for the Aged. Rochester was settled and incorporated in 1722, and chartered as a city in 1891. Rochester has the service of four railroads, all controlled by the Boston and Maine Railroad. Population 8,868.

Roch'ester, N. Y., the third city in size and commercial importance in the Empire State, is located in the Genesee river-basin, seven miles from Lake Ontario. Its elevation above the lake ensures perfect drainage, which, with an inexhaustible water-supply, enables it to rank in healthfulness first among the cities of the state. It was settled in 1812; incorporated as a village in 1817 and created a city in 1834, and now contains 181,666 population. It contains 125 churches (67,000 communicants), four well-equipped hospitals, a municipal hospital (tor contagious diseases), the insane asylum or state hospital, five orphan-asylums and a home for the friendless. It has 38 public schools, 18 parochial schools, three academies, Rochester Theological Seminary (Baptist), Saint Bernard's Theological Seminary (R. C.), Rochester University, Rochester Athenæum and Mechanics' Institute (a technical trade-school), a large deaf-mute school, private classical and preparatory institutions and one public library. Here is Western New York Industrial School, a state-reformatory, containing about 1,000 pupils of both sexes. Rochester's principal industries embrace the manufacture of shoes leather-products, clothing, flour, optical instruments, buttons, kodaks, photographic materials, sewer-pipe, beer, tobacco, furniture, candy, canned goods, time-locks and typewriting machines. These industries have an invested capital of $52,000,000, and produce $300,000,000 worth of goods annually. The largest nurseries in the world are at Rochester, and the production of flowers and flower-seeds comprises an important industry. As a shipping-point the city has the advantages of nine railways, Erie Canal and a fine harbor on Lake Ontario — Port Genesee. The 19 surrounding townships comprising Monroe County are fertile and productive, having a valuation of $37,000,000. The city is noted for fine parks (666 acres), wide streets, beautiful drives and surrounding pleasure-resorts. Population 218,149.

Rock'efell'er, John Davidson, American capitalist and president of the Standard Oil Company, was born at Richford, N. Y., July 8, 1839, and at an early age removed with his parents to Cleveland, O., where he was educated in the public schools. His business career began in the office of a commission-merchant, and in the sixties, when he showed great aptitude for commerce, he engaged in the oil-business, which in its gigantic developments has yielded him an immense fortune. In the seventies and eighties various oil-operating firms were consolidated into the gigantic trust, now known as the Standard Oil company, of which Mr. Rockefeller is the head. In 1906 Frederick T. Gates, Mr. Rockefeller's business representative, said: "Mr. Rockefeller has at various times authorized the statement that his fortune cannot exceed $250,000,000 or $300,000,000." His gifts to education, religion and other benevolences have reached an aggregate of over $87,000,-

000. To the University of Chicago he has given $23,924,322. To the General Education Board, an organization formed by John D. Rockefeller, Jr., and others and chartered by Congress, he gave $1,000,000 in 1903, $5,000,000 in 1905 and $32,000,000 in 1907; a total of $43,000,000. The board in thanking the donor said: "This is the largest sum ever given by a man in the history of the race for any social or philanthropic purpose."

Rock'et. See FIREWORKS.

Rock'ford, Ill., a thriving city on both sides of Rock River, about 85 miles northwest of Chicago. It has five bridges, three of which are railroad bridges, five railroads, flouring, paper, five hosiery factories, five factories of agricultural implements, 30 of furniture, 24 for machinery and three for pianos; one piano-action establishment and the largest leather-factory in the United States, besides manufacturing cutlery, pumps, carriages, watches, silver-plated ware, boots, shoes, wire goods, wood-engravings and other products. The city is well-built, and is noted for the intelligence and enterprise of its citizens. Rockford College is one the best and oldest college for women in the country. Population, 54,342.

Rock'ing-Stones or **Logans** are large masses of rock so finely poised as to move backward and forward with the slightest impulse. Some rocking-stones occur near remains of ancient fortifications, which seems to confirm the statement, in one of the poems of Ossian, that the bards walked, as they sang, round the stone and made it move as an oracle of the fate of battle. In Greece rocking-stones occur as funeral monuments, and are generally found on conspicuous places near the sea. The rocking-stone of Tandil in the Argentine Republic, 250 miles south of Buenos Aires, weighs 700 tons, and yet is so nicely poised that it rocks in the wind and may be made to crack a walnut.

Rock Island, Ill., a city on the Mississippi, opposite Davenport, Ia. — the two towns being connected by a wrought-iron bridge which cost over $1,000,000 — is 180 miles from Chicago. The island in the Mississippi, from which the town is named, belongs to the United States government and is retained as an arsenal for the manufacture of soldiers' equipments, including small arms. Its area is about 1,000 acres; it is beautifully wooded and, with its winding drives, serves as a park for the citizens of Davenport, Moline and Rock Island. The channel south of the island has been dammed so as to furnish immense water-power for the arsenal's use, as also for private plants and public utilities. The city has saw-mills, besides foundries, machine-shops and factories which produce wagons buggies, plows and stoves. Population 24,335.

Rockland, Me., city and county-seat of Knox County, on an inlet of Penobscot Bay, 86 miles from Portland. Its harbor has natural protection against storms, except from the northeast, and against these by a breakwater. This was built by the federal government at a cost of $500,000. Among its important industries are the quarrying of granite, shipbuilding, the manufacture of lime, steam and gasoline engines, blacksmiths' and granite-workers' tools. Fishing is carried on to some extent; clams and sardines are canned; and more than 2,000,000 pounds of lobsters are shipped from here annually by rail. Rockland has the service of the Maine Central Railroad, and has steamboat connection with Portland, Boston, Bangor and all important coast and island towns of eastern Maine. It also is the center of an electrical railway system extending northward and westward, and the towns of this connected region attract many summer tourists. Population 8,174.

Rock River rises in the southeastern portion of Wisconsin, and flows south and southwest into Illinois, emptying into the Mississippi three miles below Rock Island. Its course of nearly 400 miles is through a region noted for beauty and fertility.

Rocks. See GEOLOGY.

Rock'y Mountains, a vast system of ranges in the western portion of the United States and the British possessions. They are a continuation of the Cordilleras of Mexico. The greatest breadth of this system in the United States is 1,000 miles, and their total area is nearly 1,000,000 square miles. From 32° N. to 40° N. the ranges bear nearly north and south; between 40° and 45° their course is northwest; then, after a more northerly bend, they keep a course nearly parallel with the Pacific, but have many detached ranges and peaks. Mt. St. Elias is 18,024 feet high, and marks the boundary line of longitude between Alaska and the British possessions. Mt. McKinley in Alaska is 20,464 feet and Mt. Wrangell (also in Alaska) 17,524 feet. Mount Shasta, in the coastal range in northern California, is 14,510 feet high; Mt. Whitney, also in California, 14,898 feet. Frémont's Peak, near the western boundary of Wyoming, is 13,576 feet high, and Mt. Rainier, in Washington, 14,444 feet. In British Columbia Mt. Brown rises 16,000 feet, Mt. Hooker 15,700 and Mt. Logan 19,500. The central range of the Rocky Mountains forms the ridge which divides the rivers falling into the Pacific from those falling into the Arctic Ocean, Hudson Bay and the Gulf of Mexico; but between the eastern and western ranges lie Utah and Nevada, in which are rivers having no outlets except such lakes as Great Salt Lake in Utah and Humboldt Lake in Nevada.

Rocky Mountain or **White Goat,** an American goat-antelope, as a rule is found in the mountains just above the timber-line, in high, inaccessible spots where only the boldest hunter can follow; but in British Columbia it comes toward the coast. In appearance clumsy, it is remarkably agile, an expert in climbing rocks and icy steeps. Its weight is about that of the common deer. In form it resembles the bison, the body thick-set, legs stocky, hind-quarters low, shoulders high, head carried low. The dense coat is all yellowish white, the hair next the skin fine, the outer hair long and coarse. The Indians used to make blankets of the long silky hair, and now the hides are valued. The horns are small, black, smooth and sharp-pointed, having little beauty to attract the trophy-hunter. It is found sparingly in Alaska and British Columbia, in Idaho, Montana and Washington, but the well-beaten trails tell of great numbers that once existed.

Ro'dents, or the order of *Rodentia*, form the largest order among mammals, and include upwards of 2,000 species. They range in size from the mouse to the South American capybara, which is almost as large as an ordinary hog. They are characterized chiefly by the nature of their teeth. They have no canine teeth; but have long, curved, very sharp incisors, which are separated from the molars by a considerable gap. The molars are few; and are moved sideways with the jaw in the characteristic gnawing of animals of the order. Among well-known rodents may be mentioned (besides the many familiar species of rats and mice) the beaver, hare, agouti, jerboa, guinea-pig, muskrat, mole-rat, rabbit, marmot, squirrel, woodchuck, porcupine, capybara and lemming. Rodents live almost absolutely upon vegetable food. They often are cunning and are guided by elaborate instincts, as in the case of the beaver. Some of them make great migrations, as, *e. g.*, the lemmings. The furs of some of the group are of value, and some are edible. The ordinary rats and mice, however, are pernicious and destructive; and it has recently been demonstrated that rats are chiefly responsible for the spread of the bubonic plague in India and elsewhere.

Rodg'ers, John, an American naval officer, was born in Maryland, Aug. 8, 1812, his father being the Capt. John Rodgers who distinguished himself by firing the first gun on the British during the War of 1812. He entered the navy in 1828, and was commissioned captain in 1862. Next year, while in command of the monitor *Weehawken*, he captured the Confederate *Atlanta*, and was promoted to be commodore. He became rear-admiral in 1869, and was superintendent of the United States Naval Observatory at Washington from 1877 until his death, May 5, 1882.

Rodin (*rō'dăn'*) **Auguste,** a French sculptor, was born at Paris in 1840. In 1875 he exhibited in the Salon. He disregards the conventionalities of classic style, and expresses the first feeling or act of a subject. So his sculptures are fantastic and rugged. Though he has a power of execution that is said to be worthy of the best artists of the Renaissance, he tries to express things beyond the scope of sculpture. Among his creations are a bust of Hugo, a statue of Balzac and *The Burghers of Calais*.

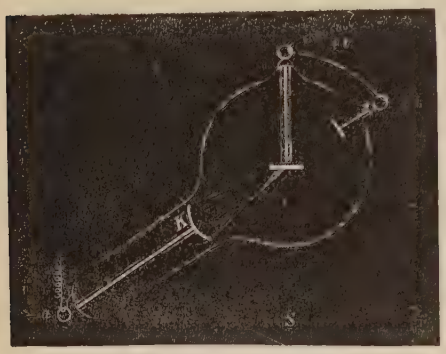
Rod'man, Thomas J., was born at Salem, Ind., in 1816, and after graduating at the United States Military Academy was commissioned lieutenant of ordnance in 1841. To him belongs the honor of inventing a method of casting large guns about a hollow core and cooling the metal from the inside. He died at Rock Island, Ill., June 7, 1871.

Rodrigues (*rō-drē'gĕs*) is a volcanic island 375 miles east by north of Mauritius, of which it is a dependency. Its area is 42 square miles, population 3,200, of whom less than 200 are pupils in the government-schools. The Portuguese discovered the island in 1645, the British took possession in 1814, and its isolation in the Indian Ocean, which prevents changes among its animals and plants, makes it important to zoölogists and botanists. The solitarie, a bird now extinct, survived here almost until 1700. The chief export is cocoa-oil.

Roem'er, Ole, a Danish astronomer, is known principally as the man who first discovered that light travels with a finite speed. Born in 1644, he died in 1710. He was educated at the University of Copenhagen. The years from 1672 to 1681 he spent in the Paris Observatory. Then he returned to Copenhagen as professor of astronomy, a position which he held until death. During his Parisian residence he studied the motion of Jupiter's satellites and showed from inequalities in the motion of the first satellite that the speed of light across the orbit of the earth is approximately 309,000,000 meters a second, a result which is not so very far — perhaps three per cent.— from the best modern measures. Roemer devised the transit instrument, the meridian circle and the alt-azimuth instrument; but he was in advance of his times and adoption of his inventions was delayed until many years after his death. See Grant's *History of Physical Astronomy*.

Roentgen (*rĕnt'gĕn*) **Rays.** About the beginning of 1896 Roentgen, a German physicist long and favorably known to the scientific world, discovered that rays which *in many respects* are similar to Lenard's can be observed through a very large region outside of an ordinary Crooke's tube. These are the so-called X-rays. Among the most important properties of these rays are the following:

1. They take their origin at those points where cathode rays strike upon matter. Thus, in the accompanying figure the cone of rays leaving the curved cathode K are



ROENTGEN-RAY TUBE

cathode rays, while the sheaf of rays, S, leaving the flat plate are X-rays. 2. Unlike cathode rays, they pass through glass, air and various materials with little absorption. 3. Unlike ordinary light, they are not reflected or refracted, but pass straight through ordinary material without deviation. 4. They excite fluorescence in many substances, especially in platinum-barium-cyanide and some similar salts. Hence a plate covered with these salts is widely used for observing shadows cast by X-rays. In this manner the bones of the hands, arms or legs, are easily "seen." Such a device is called a *fluoroscope*. 5. They are not deflected by a magnet as are cathode rays. 6. They produce electrolysis in air and other gases through which they pass. Such gases are made conductors by the passage of X-rays, and are said to be ironized or roentgenized. They behave in a similar way toward paraffine and some other solid insulators. See BECQUEREL RAYS and CATHODE RAYS.

Roentgen (*rĕnt'gĕn*), **Wilhelm Konrad,** eminent German scientist, distinguished investigator of physical problems and discoverer of the X or Roentgen rays, was born in Düsseldorf, Prussia, in 1844. Educated at Zürich and Utrecht, he became professor of physics and director of the laboratory at the University of Würzburg, Bavaria. He also taught at Strassburg and at Giessen. In December, 1895, he communicated to the Würzburg Physico-Medical Society his remarkable discovery of the new and powerful X-rays, since known by his name, and in the following month he described his discovery at the celebration of the semicentennial of the founding of the Berlin Physical Society. Later he demonstrated the rays in the presence of the Emperor of Germany, who decorated him, and Prince Ludwig of Bavaria created him a baron. The application of the X-rays in surgery has been fraught with wonderful and beneficent results. By the X-ray picture pulmonary tuberculosis is better detected, and heart-disease can be more accurately learned from it than by percussion of the chest.

PROFESSOR ROENTGEN

Rog'ers, Henry Wade, LL.D., American educator and legal authority, was born at Holland Patent, N. Y., Oct. 10, 1853, and educated at the University of Michigan, Ann Arbor. He studied law and in 1877 was admitted to the bar. Later he became professor of law and dean of the law-faculty in his *alma mater*. In 1890 he was appointed president of Northwestern University, resigning in 1900 and in 1901 accepting the chair of constitutional law at Yale. He was the author of *Expert Testimony* and *Illinois Citations*, and for some years edited *The American Law Register*. He died in 1913.

Rogers, John, American sculptor and modeler, was born at Salem, Mass., Oct. 30, 1829, and was educated at the public schools of Boston. Early in life he became interested in clay-modeling, and in 1858 went to study art in Europe. Returning to the United States in 1859, he modeled a group, *The Checker-Players*, which attracted favorable attention; after this he took scenes occurring in the Civil War as themes of his compositions; these were soon known as Rogers' Groups and well merited their popularity. The best known, some of which were reproduced in terra-cotta, are the *Picket Guard* and *One More Shot*, besides those of a social character, as *The Favorite Scholar*, *Coming to the Parson*, *Going for the Cows* and *The Slave-Auction*. He also produced a large equestrian statue of General Reynolds, which fronts the city-hall of Philadelphia. He died in July of 1904.

Rogers, Randolph, American sculptor, was born at Waterloo, N. Y., July 6, 1825, and, after following mercantile pursuits in early life, went to Rome to study the sculptor's art. Among his works are the designs for the Washington monument at Richmond, Va., a statue of John Adams in Mt. Auburn cemetery, a memorial monument at Providence, Rhode Island, a still larger one for Michigan at Detroit and the bronze statue of Lincoln at Philadelphia. He died at Rome, Jan. 15, 1892.

Rogers, Samuel, English poet was born at Stoke-Newington, July 30, 1763. After obtaining a private education, he entered

his father's bank in London at 17, and in 1793 became head of the firm. In 1792 appeared the poem on which his fame is chiefly based, *The Pleasures of Memory*, which in 1816 had reached a nineteenth edition. Then followed *An Epistle to a Friend*, *Voyage of Columbus*, *Jacqueline* and *Italy*. Rogers was rich; but his poetry, whatever its merits, is wholly a thing of the past. It is now but little read or quoted. He died at London, Dec. 18, 1855.

Rojestven'ski, Sinovi Petrovich (1848–). See RUSSO-JAPANESE WAR.

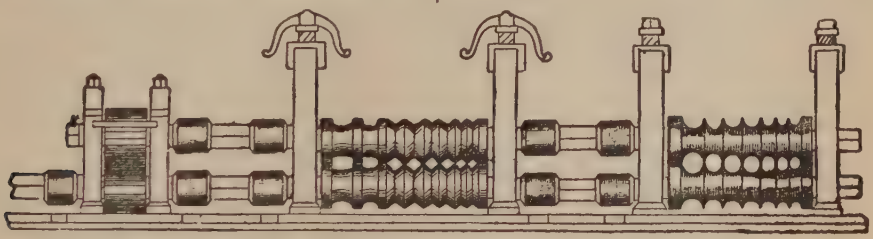
Ro'land, the hero of one of the most popular epic poems of Frankish literature, was, according to tradition, the nephew and favorite captain of Emperor Charlemagne. Through the middle ages the *Song of Roland* was the most popular of the many poems current; and William of Normandy, when on his way to conquer England, had it sung at the head of his troops to encourage them on their march. Even now the memory of Roland is still held in honor by the hardy mountaineers of the Pyrenees, among whose defiles the scene of his exploits is laid.

Roland (*rō'lān'*), **Marie** (or **Manon**) **Jeanne Phlipon,** was born at Paris, March 18, 1754. From a child she was a great reader, devouring all that came in her way, and the reading of Plutarch made her a republican. In February, 1780, she married Roland, who afterwards became the leader of the Girondists. In 1791, in Paris, Madame Roland, with her masculine intellect and woman's heart, became the queen of a coterie of young and eloquent enthusiasts that included all the famous and ill-fated leaders of the Gironde, Brissot, Buzot, Petion and at first even Robespierre and Danton. Roland made himself hateful to the Jacobins by his protests against the September massacres, and took his part in the last ineffectual struggle of the Girondists to form a moderate party. On May 31 the sound of the tocsin announced the proscription of the 22. Roland had been arrested, and while his wife went to protest against his imprisonment, he escaped and fled to Rouen. She was arrested and spent months in prison before death closed her tragedy of life. During this time she wrote her unfinished *Mémoires*. Her character, made perfect through suffering, took on a new refinement; she carried some of the sanctity of the martyr with her to death, and still, in Carlyle's phrase, like a white Grecian statue, serenely complete, she shines in that black wreck of things. On Nov. 8 (1793) she was carried to the guillotine with a trembling printer, whom she asked the executioner to take first, to save the printer the horror of seeing her head fall. As she looked up at the statue of liberty, she exclaimed: "O Liberty, what crimes are committed in thy name!" A week later her husband died by his own hand near Rouen, unwilling to live longer in a world of crime. See Sainte-Beuve's *Portraits of Women*.

Roller-Skate. See SKATING.

Rol'lin, Charles, a French historian, was born in Paris in 1661. He studied in the *Collége du Plessis*, in which he became assistant-professor of rhetoric in 1683. In 1688 he was made professor of eloquence in the *Collége de France* and was chosen rector of the University of Paris in 1694, a position which he held for two years only. In this short time, however, he was able to distinguish himself by many important reforms. In 1696 he was appointed coadjutor to the principal of the *Collége de Beauvais*, from which, being an ardent Jansenist, he was removed through the influence of opponents in 1712. The remainder of his life was devoted to study and to writing. He published an edition of Quintilian in 1715 and *Traite des Etudes* in 1726. His *Histoire Ancienne* has been frequently reprinted and re-edited in French and in English. He began a *Histoire Romaine*, but never completed it. These works once were popular, but now are of little historical value. He died at Paris in September of 1741.

Roll'ing-Mills are machines rotated by steam-power and used for manufacturing

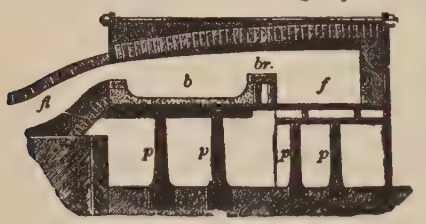


ROLLING-MILL

rods, bars, plates, beams etc. of metal. The rolls usually are of cast-iron, and are made in various forms according to the shape of the product. The cut shows rolls used for making square bars and round rods. Those used for making plates and sheets of metal are perfectly smooth, and are gradually brought together, as the metal is passed through, by means of the screws at the top. The picture shows a train of two rolls where the piece has to be brought back to the

same side for each passage through the rolls, unless the machinery is reversed in direction each time. Trains of three rolls are frequently employed, so that the rolling takes place back and forth, first between the lower two rolls, then between the upper two. Steel, wrought iron, copper and brass as well as other metals and alloys are frequently rolled. Usually the metal is rolled while hot, but certain products are finished by cold rolling in order that they may be harder and stiffer. All the steel and iron rails used for steam and electric roads, as well as the beams and bars used for buildings and bridges, are produced by rolling.

PUDDLING. Pig-iron, the crude form of iron which is produced from iron-ore by smelting (see BLAST-FURNACE), is changed to wrought-iron, a metal that can be hammered, rolled and welded by puddling. This is an operation by which the carbon. silicon, sulphur and other impurities are removed from the iron. The puddling-furnace in which the process is conducted is shown in the figure, where *f* is the fireplace, *br* the bridge, *b* the bed, *fl* the flue and *p p p p* the iron pillars supporting the furnace. When the fire is burning, the flame goes over the bridge, strikes the arched roof and reverberates down upon the iron, which is placed in the bed. When the roof, walls and bed of the furnace are moderately heated, the puddler "fettles" his furnace by plastering the bed and sides with a fettling composition, which consists of ground oxide of iron made into a paste with water. The crude iron is now thrown in, the fire made and the charge heated. During the melting the puddlers stir the mass with a long iron rod. Presently the heated mass thickens, and solid granules are formed amid the liquid. These solid granules are squeezed together into a spongy mass or ball and rapidly carried to the hammer, where it is struck lightly at first



PUDDLING-FURNACE

and compressed into shape. During this beating or "shingling" liquid cinders are squeezed from the mass like water from a sponge. The puddled iron is then passed through rollers by which further impurities are squeezed out, and the iron is formed into bars, plates or thin sheets, as is desired for different purposes of manufacture. The puddling and rolling of iron was first practically introduced by Henry Cort in England in 1784, and since then many improvements have been introduced. Puddling has lost much of its importance since the introduction of mild steel, made by the Bessemer and open-hearth processes, which has largely taken the place of wrought iron.

Romagna (*rô-măn'yà*), formerly the name of a region of Italy, forming the northern portion of the states of the church and comprising the *delegations* of Bologna, Ravenna, Ferrara and Forli. In 1861 these delegations became provinces of the kingdom of Italy. Population 1,359,167.

Ro'man Empire. To give an adequate history of this mighty nation from the alleged founding of Rome by Romulus in 753 B. C. to the taking of Constantinople in 1453 A. D. would require many volumes. Concerning the early settlement of Italy it is impossible to form definite conclusions; but we seem at least warranted in affirming that at a very remote period a race emigrated from the east, embracing the ancestors both of Greeks and Italians; and Mommsen the historian's statement that "the Italians, like the Indians, entered their peninsula from the north" may be regarded as certain. But in addition to the so-called Italian races, there settled in Italy in prehistoric times the Iapygians, the Etruscans, the Greeks and the Gauls, and from the mingling of all these came the people of Rome. Recent investigations have shown the story of Romulus and Remus to be a mere myth; but it is probable the city was founded before the time when it is alleged that they were suckled by a she-wolf Perhaps the most rational view of the city's origin is that suggested by a consideration of its site. It probably was first built as a defense against the Etruscans and as an emporium for river-traffic; but whether it was founded by the Latin confederacy or by the enterprise of an individual chief is beyond even conjecture. The motives which led to the founding of Rome also caused its rapid development, so that the beginnings of Roman history — if the ancient legend may be called history — mainly are records of the city's expansion and growth An accurate history of the early Roman state is out of the question, as the traditions concerning the first four kings are too mythical to form the basis of sober narrative; but with the fifth king, Tarquinius Priscus, a marked change takes place, and we can at least feel that we are beginning to leave the field of tradition and approach that of history. The expulsion of the younger Tarquin about 509 B. C. in revenge for the outrage on Lucretia marks the overthrow of the monarchy and the establishment of the so-called republic which continued nearly 500 years.

The history of Rome from the establishment of the republic to the abolition of the decemvirate, 449 B. C., was chiefly military, as the Romans were engaged in constant wars with their neighbors, especially the

Etruscans. These conflicts continued until 295 B. C., when the final victory over the Samnites and Etruscans ended the struggle and brought all Italy under Roman dominion. Having thus extended her power over Italy, it was but natural that Rome should become involved in wars with foreign nations; and in 264 B. C. began the terrible contest with Carthage, which comprised three separate wars, known as the three Punic wars, which closed only with the complete destruction of Carthage more than a century later. In connection with the Punic wars began the Macedonian wars — also three in number — which ended with the battle of Pydna, 168 B. C., in which the Macedonian empire was completely broken up. According to Polybius the full establishment of the Roman empire was achieved at Pydna, as this was the last battle in which she was confronted by a civilized nation; all her subsequent wars were against rebellions of her own provinces or in contests with so-called barbarians. The subsequent history of the republic — the war with Jugurtha, the Servile wars, the civil wars of Marius and Sulla, the campaigns of Julius Cæsar, the civil wars between Cæsar and Pompey and the final assumption of power by Octavius Cæsar under the title of Augustus — has been given under appropriate heads, and need not be repeated here. When Augustus died, 14 A. D., the Roman empire extended in the north into Germany beyond the Rhine; in the east the boundary line was the Euphrates; in the south Egypt and northern Africa as far west as Morocco and as far inland as Fezzan and Sahara acknowledged the Roman authority. The subsequent reigns of Tiberius, Caligula, Claudius and Nero are little more than the record of conspiracies, assassinations and acts of tyranny; but the with reign of Vespasian, 69 A. D., a better era commenced, which, if we except the reign of Domitian, continued for the next hundred years and comprised the reigns of Titus, Nerva, Trajan, Hadrian and Marcus Aurelius, the latter of whom, especially, was one of the wisest and most beneficent rulers the world has known. Nothing is clearer than the fact that after the time of Vespasian the worst days of Rome were over. Never again did she give way to the immorality and corruption of the first century.

During the rule of Valerian, Gallienus and the so-called Thirty Tyrants the empire was chaos, subject to inroads and invasions from barbarians; but with Claudius Gothicus its fortunes begin to brighten. By him and his successors (Aurelian, Probus and Carus) the barbarians both of the north and of the east were severely chastised, and when Diocletian became emperor, 284 A. D., it seemed as if the worst was over; but his division of the empire into east and west led to civil wars, which were brought to a close only by the commanding genius of Constantine. Under Constantine, who reigned from 324 to 337 A. D., Christianity, which had hitherto been despised and persecuted, was established as the religion of the state and taken under the protection of the emperor. Constantine also transferred the seat of government from Rome to Byzantium on the Bosporus, where he founded Constantinople, naming it after himself. From the time of Constantine the political fortunes of Rome possess only a secondary interest, as it is the struggles of the Christian sects and the rise of the church that mainly occupy the attention of the historian. Christianity did not save Rome from destruction, but it enabled it to endure three centuries of barbarism. Julian's attempts to revive paganism were an utter failure in spite of his abilities as a general and the virtues of his personal character; and in the year after his death Valentinian was acknowledged as emperor by the army at Nicæa. In obedience to the wish of his soldiers he conferred the title of Augustus upon his brother Valens, and the complete division of the empire was at last effected, Valentinian becoming emperor of the west and Valens of the east. Valentinian, Gratian and Theodosius the Great were rulers worthy of better times; but they struggled against destiny, and their efforts were vain Theodosius, indeed, subdued and even disarmed the Huns, by whom Rome was invaded; but immediately after, they rose again under Alaric against Honorius, emperor of the west. Rome was saved for the time by the bravery and skill of Stilicho, the imperial general; but after his assassination the barbarians returned, sacked the city and ravaged the entire peninsula.

The murder of Valentinian III occurred in 455 A. D., and Eudoxia, his widow, to be revenged on Petronius Maximus, his murderer and successor, invited Genseric from Africa, thus exposing Rome to the horrors of pillage for days. Ricimer, a Sueve, next figures as a sort of governor over the city and the few relics of empire that it still possessed; for Gaul, Britain, Spain and western Africa had all been wrested from it. Of the four emperors whom Ricimer placed on the throne, Majorian was the only one who had any of the qualifications of a ruler. Ricimer died in 472, and was succeeded by Orestes the Pannonian. Odoacer in 476, placing himself at the head of the barbarian mercenaries, overthrew the last emperor of the western empire, who, by a curious coincidence, bore the same name as the mythical founder of the city — Romulus. This was the end of the western empire; but for nearly a thousand years thereafter the eastern empire, whose capital was Constantinople, maintained its existence in spite of all the enemies by which it was surrounded, until Constantinople was taken by Mohammed II in 1453. Consult Gibbon's *Declin*

and Fall of the Roman Empire, Merivale's *Romans under the Empire*, Duruy's *History of Rome*, Bryce's *Holy Roman Empire* and Bury's *The Later Roman Empire*. See, also, ROME.

Romance', a term derived from Roman, was originally applied to the languages which have been derived from Latin, as French, Italian or Spanish, and to anything written in these languages. But, because during the middle ages the favorite literature in these languages was a certain type of fiction, *romance* came to be the special designation of the tales of chivalry and adventure which were sung by troubadours generally in verse. Romances of this type sprang from the epic. Thus it has been pointed out that the *Odyssey* is more a romance than the *Iliad;* because to a greater degree than the *Iliad* it obviously is imaginative rather than historical. The romances of the middle ages were developed into what are called cycles, in each of which a related group of persons and their achievements became grouped around a central figure. The greatest of these cycles were those which centered around the siege of Troy and the adventures of Alexander the Great, Charlemagne and King Arthur respectively. In the tales about Arthur, Sir Tristram won so great a place that a cycle of Tristram also grew up almost independently of the tales of Arthur's court. There were English cycles of romance spun about the legendary names of Guy of Warwick and Bevis of Hampton. The Norse sagas and the Teutonic *Nibelungenlied* are modified forms of the romance.

Out of these medieval romances developed the notion of the modern romance or novel. The beginning of the modern romance may be traced in the Spanish tale of *Amadis of Gaul*, the famous *Arcadia* of Sir Philip Sidney, the French *L'Astrée* of Honoré d' Urfé and the long stories of Madeline de Scudery. The first modern novels in the strict technical sense of the term were those of Richardson and Fielding in the eighteenth century.

In music, romance has reference to a type of song which lies between the epic and lyric and suggests a ballad, except that its theme belongs to the realm of chivalry. The word romance has not lost the significance which became attached to it in the middle ages. It suggests chivalry, especially towards women, lofty endeavors, gallantry pushed to foolhardiness, an elaborate and artificial code of honor and conduct, a purely aristocratic attitude and an appeal to the imagination rather than to nature.

Romanes (*rō-mā'nĕs*), **George John**, British biologist, author and lecturer, was born at Kingston, Canada, May 20, 1848, and died at Oxford, May 23, 1894. Educated at Cambridge, England, his taste for natural science led him to study, investigate and write upon that branch of knowledge and to lecture at the Royal Institution, London, and later at Oxford, on natural history, physiology and animal and plant life. Making acquaintance with Darwin, he devoted much of his talent to the scientific exposition of evolution, taking ground adverse at first to the accepted Christian view of that doctrine, though finally expressing belief in the theistic position and opposing the mechanical theories of the origin of things. His publications include (besides a number of articles on instinct, hybridism and animal intelligence) *A Candid Examination of Theism*, *Mental Evolution in Animals*, *Mental Evolution in Man*, *Organic Evolution*, *Darwin and after Darwin*, *Jelly-Fish, Star-Fish and Sea-Urchins*, *Examination of Weismannism* and *Thoughts on Religion*. See *Life and Letters*, edited by his wife.

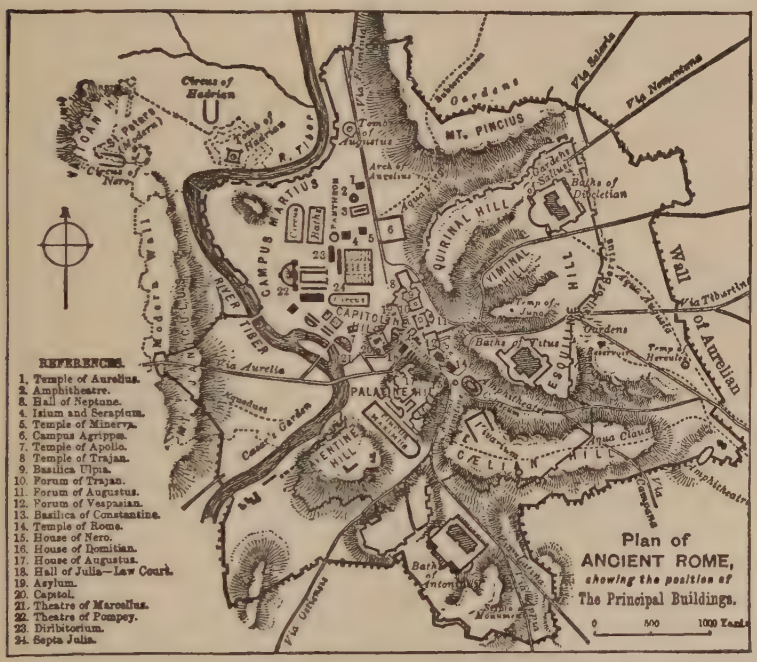
Romanoff (*rō-mä'nôf*), **The House of**, has furnished the sovereigns of Russia since the beginning of the seventeenth century. Rurik, the chief of the Varangians or Rus, laid the foundation of the Russian empire, and he and his family reigned over it for more than seven centuries. Feodor, the last descendant of the Rurik dynasty, dying childless in 1594, the government fell a prey to many adventurers. The legitimate heir to the throne, Dimitri, of the Rurik dynasty, was assassinated, and no less than four impostors arose, claiming to be the dead Dimitri. Conflicts between aspirants for the crown continued until 1613, when a large number of nobles offered the throne to the king of Poland. A sentiment was aroused against this, and the Russian army drove the Poles from Moscow. They then determined to elect a czar. A council, composed of nobles, clergy and burgesses assembled in Lent of 1613. After several days of strong debate the choice fell to Michael Romanoff, a member of a distinguished though not royal Prussian family in Moscow. He was crowned in April of the same year and reigned for 32 years. His successors in the male line ruled until the death of Peter II in 1730, when the succession reverted to the female line. Another change took place with the death of Elizabeth in 1762, when her nephew, the son of the Duke of Holstein-Gottorp, a branch of the House of Oldenburg, succeeded to the throne with the title of Peter III, thus founding the House of Romanoff-Oldenburg to which the present reigning family belongs. Frequent intermarriages with German princely families have, however, made the strain far more German than Russian.

Rome, Ga., county-seat of Floyd County, on Coosa River, 61 miles northwest of Atlanta. It has iron-foundries and manufactories of plows and nails, and ships cotton.

It is the seat of Shorter College. Population 12,099.

Rome. Modern Rome occupies the plain on each side of the Tiber (about 15 miles from the mouth) and the slopes of seven hills, the central one of which was the Palatine hill, whose summit is about 160 feet above the sea. These gave Rome the name of the City of the Seven Hills. Romulus is said to have founded the city upon the Palatine, and upon its northwestern slope grew the sacred fig, under which he and his brother Remus were found sucking the she-wolf. Upon this hill were the temple of Jupiter Stator and other sacred buildings, besides many of the finest houses in Rome. Recent excavations have brought to light numerous remains of the palatial and other structures with which the Palatine was once covered, and these are among the most interesting remains of the Eternal City. The Palatine was fortified at a very early period, and in the time of the later or Etruscan kings at least five of the hills had been surrounded by separate defenses. These fortified hills with the marshy hollows between them were then enclosed by a huge rampart or *agger* of earth. This *agger* formed the only defense until the reign of Aurelian 800 years later, and the great wall which bears the name of Aurelian is to a great extent identical with the present walls. To the period of the kings belongs the huge, arched sewer which drains the marshy hollow between the Capitoline, Palatine and Esquiline hills. In this valley was situated the Forum, containing about two and one half acres, which became both the market and the place of political meeting for the tribes that occupied the surrounding hills.

In the great aqueducts we have the most notable remains of the period of the republic. The oldest was that constructed by Appius Claudius Cæcus in 312 B. C., which brought water from springs more than seven miles away. Other aqueducts were constructed during the imperial period. These aqueducts, 14 in number, have an aggregate length of over 300 miles and are among the most striking features of modern Rome. Of the numerous temples in Rome, of which there are said to have been as many as 300, the names and sites of about half are known, the preservation of the few which remain being due to their having been converted into churches.



The *Thermæ* of Agrippa, of which the Pantheon is the only portion that remains, were the earliest of the great public baths for which imperial Rome was noted. On the low grounds at the south of the Cœlian hill were the baths of Caracalla, which were built to accommodate 1,600 bathers. The outer walls enclosed nearly 27 acres, the baths themselves occupying nearly one fourth of this space.

A large marshy plain, which now forms the most densely populated part of Rome, extended from the Capitoline, Pincian and Quirinal hills to the Tiber, which, on account of being used for military exercises, was called *Campus Martius*. Here was erected the theater of Pompey, which is said to have contained seats for 40,000 persons. *Campus Martius* was the most famous of the eight *campi* or public parks of ancient Rome. It lay outside the walls. Originally a place for military exercises and contests and for the assemblings of the people, it later became a suburban pleasure-ground and was laid out with gardens, walks, baths, a race-course and theaters. Marble halls were built there by Julius Cæsar, public baths and the Pantheon by Agrippa, the Egyptian obelisk and his own splendid

tomb by Augustus. Here also was built the first amphitheater of stone. Later the *Campus Martius* became crowded with public buildings and private dwellings, and was inclosed within the city boundaries. Near the capitol was the theater of Marcellus, of which a considerable portion yet remains. This was begun by Julius Cæsar and finished by Augustus in 11 B. C., who named it after his nephew. The Flavian amphitheater, known as the Colosseum, which was built for gladiatorial exhibitions and the combats of wild beasts, is an ellipse, the longer diameter measuring a little over 600 feet and the shorter a little over 500. It rises 160 feet, and covers five acres. The oldest circus was *Circus Maximus* in the valley between the Palatine and Aventine hills, which was about three furlongs in length and one in breadth, and is said to have seated 250,000 persons. The arrangements of a Roman circus can best be studied in the well-preserved circus on the Appian Way, which usually bears the name of Emperor Maxentius but is more correctly assigned to Romulus, his son. Of the 12 bridges over the Tiber three are survivals of the eight or nine bridges of ancient times, the oldest being *Pons Fabricius*, leading from the city to the island in the Tiber.

The population in the time of Vespasian has been estimated at 2,000,000, but it is extremely doubtful if it ever exceeded 1,000,000. The walls, which enclose nearly 4,000 acres, are 14 miles in circumference, with 15 gates, two of which are closed. The largest palaces are the Vatican, the residence of the pope, and the Quirinal, the residence of the king, formerly a papal palace, in which were held the conclaves of cardinals for the election of popes. The chief papal collections are contained in the galleries attached to the Vatican, probably the largest palace in the world. In addition to the private gardens and apartments of the pope, the Vatican comprises large reception-halls, with chapels, libraries, picture-galleries and vast museums of sculptures, ancient inscriptions and other antiquities. The famous Vatican Library, with its priceless manuscripts and collections of early printed books, occupies two immense halls.

The churches, said to number upward of 300, are among the most conspicuous features of modern Rome. St. Peter's, the largest cathedral in the world, begun in 1506 and completed in 1626, covers five acres and cost $10,000,000. There also are churches of the great religious orders, 28 parish churches and titular churches of the cardinals. Before Rome became the capital of Italy in 1870, the greater part of the Pincian, Quirinal and Esquiline hills was occupied by villas of nobles; but these have mostly been destroyed and their sites covered with modern houses, in many cases with blocks of buildings many stories in height, let out in tenements. The ancient city is assuming the aspect of a modern capital, broad, straight thoroughfares running through many quarters formerly occupied by narrow streets and mean, crowded houses. The seven hills, as such, have almost ceased to exist. One of the greatest of improvements is the embankment of the Tiber and the straightening and deepening of its channel, which ended the disastrous floods to which the lower parts of the city were formerly subject. All the necessaries of life have to be imported from a distance, as Rome is surrounded by the *Campagna di Roma* (*q. v.*), a marshy plain which includes the greater part of ancient Latium and, for the most part, is an untilled and uninhabited waste, about 90 miles in length and from 20 to 40 in width. Corn and wine are brought from Tuscany and from the fertile *Terra di Lavoro* near Naples. There are practically no manufactures; and the prosperity of the city depends mainly on the courts of the king and the pope and on the foreign visitors who crowd the hotels during the winter. The railways from all parts of Italy converge outside the city, which they enter near *Porta Maggiore* on the Esquiline, having a common terminus on the summit of the Quirinal. See ROMAN EMPIRE. See Vernon Lee's *The Spirit of Rome*, Hare's *Walks in Rome*, Mommsen's *Rome* and Crawford's *Ave Roma Immortalis*. Population of the city 538,634; of the district 1,298,142.

Rome, N. Y., a city, county-seat of Oneida County on Mohawk River, 100 miles west of Albany, at the junction of the Barge and Black River Canals. It contains mills and manufactories of iron, brass, copper, furniture, machinery, saddlery, wire and other goods. Rome has admirable public schools, St. Peter's Academy (R. C.), two libraries and several churches. The city has all the improvements of a progressive city and the service of two railroads. Here is Fort Stanwix, which was successfully defended against St. Leger, and six miles to the southeast the battle of Oriskany was fought during the Revolution. Population 20,497.

Ro'meo and Ju'liet, a drama by William Shakespeare, written sometime between 1591 and 1596, first published in 1597. The legend upon which it is founded first appeared in Naples in 1476. It appeared in English in 1562 in *The Tragicall Historye of Romeo and Juliet* by Arthur Brooke, which furnished the main foundation for this drama. The legend has often been chosen for operatic purposes. The best opera based upon it is that by Gounod, which first appeared in 1867.

Rom'ola, one of the best of the novels of George Eliot, first published in serial form in the *Cornhill Magazine*, 1862–3, deals

with Italian life in the period of the famous Savonarola. It was a period of political as well as religious crisis, for the French were intriguing against the power of the Medici. Savonarola threw his whole weight on the side of Christian simplicity in the reaction against the artistic paganism which the Medici had encouraged. The most notable character in the book is Tito Melema, the handsome but false Greek. Tito wins the hand of Romola, who is the daughter of a blind scholar named Bardi. He plays her false and dies. Meantime Romola's better self, that which is swayed by the spirit of Savonarola (*q.v.*) and not the Medici, comes to the front; and she devotes her life to love and charity.

Rom'ulus, legendary founder and first king of Rome, son of Mars by Rhea Silvia, daughter of King Numitor of Alba Longa, was, so runs the myth, exposed with Remus, his twin-brother, at the foot of the Palatine hill, where he was suckled by a she-wolf, and afterward brought up by the shepherd Faustulus and his wife, Acca Laurentia. In 753 B. C. he founded his city on the Tiber, to which he invited all homeless fugitives in the surrounding country, who carried off Sabine maidens for their wives. After Romulus had firmly established his city and secured peace between the Romans and Sabines, he was carried to heaven in a chariot of fire and later was worshiped as Quirinus.

Rook, an Old-World bird belonging to the crow family. It is slightly smaller than the

ROOK

common crow. Its plumage is purplish black, with gray on the forehead and throat. The adults lose the feathers on the face, leaving a bare spot about the bill. These birds live in noisy flocks and nest near habitations. They are common in many parts of Europe and Asia, and in late autumn migrate to the east shore of Great Britain and return in the spring

Roosevelt (*rō'ze-vĕlt*), **Theodore,** twenty-fifth president of the United States, was born at New York City, Oct. 27, 1858, and graduated from Harvard University in 1880. In 1882 he entered the New York legislature, and rose to a commanding position as reformer. In 1895 he was made president of the police commission of New York City and made his service notable by important reforms. On the outbreak of the Spanish-American War he was appointed assistant-secretary of the United States navy, but resigned after a few months' service and organized the 1st United States cavalry volunteers, popularly known as Roosevelt's Rough Riders, which he commanded, and with this body rendered distinguished service in Cuba, especially at the battle of Las Guasimas and at El Caney and San Juan hill. In 1898 he was elected Republican governor of New York, and in 1900 Vice President of the United States on the ticket with Mr. KcKinley, upon whose death he became president. In 1904 he was himself elected to that office and in that wider field, displayed the same executive ability and devotion to public service which had characterized his previous career.

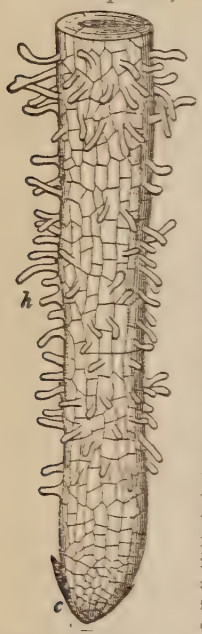
THEODORE ROOSEVELT

In 1912 he was nominated for President by the Progressive Party, which he helped to form (see TAFT). Although defeated by the Democratic candidate Woodrow Wilson, he polled a large vote, second only to that of Mr. Wilson, and its leaders announced that the organization of the party would be made permanent. A dramatic feature of the campaign was the attempt on the life of Mr. Roosevelt at Milwaukee by an insane man, as a result of which Wisconsin passed a law providing thirty years imprisonment for attempts to kill a presidential candidate.

Among the important features of his administrations were: Prosecution of corporations accused of violating federal laws: securing of the Panama canal-zone by the United States (see PANAMA CANAL); establishment of civil government and opening of public schools in the Philippines; the establishment of agricultural and other bureaus for the development of their rich resources, the meeting of the first Filipino legislature in 1908; the creation of the Department of Commerce and Labor; commercial treaties with Cuba and China; the mediation of President Roosevelt between Russia and Japan, thus ending the war; the settlement with Great Britain of the Alaskan boundary; the completion of the Pacific cable to the Philippines; the Cuban revolution; the pacification of the island under American occupation and its restoration to the newly organized republic in 1909; the passage of the pure-food bill and the railroad-rate bill, the admission of Oklahoma into the Union. After the close of his term as president, Roosevelt spent a year hunting in Africa. In 1916 he declined the Progressive nomination, then, with many Progressives, vigorously supported Hughes, the Republican candidate.

Mr. Roosevelt at one time expected to make literature his life-work. His chief writings include *The Winning of the West, American Ideals, The Rough Riders, Life of Gouverneur Morris, Life of T. H. Benton, History of the Naval War of 1812, Life of Oliver Cromwell, The Strenuous Life, The Wilderness-Hunter, Hunting the Grizzly, and Hunting-Trips of a Ranchman.*

Root. True roots are developed only by vascular plants, that is, by *Pteridophytes* (fern-plants) and *Spermatophytes* (seed-plants). They act either as holdfasts or as absorbing organs or as both. The ordinary soil-roots serve both for anchorage and for absorbing. In structure roots are all alike in general plan, whether they belong to ferns or to pines or to the true flowering plants. Each root consists of an epidermis, a more or less thick cortex and a central, solid, woody cylinder or axis. In the soil-roots a peculiar cap of dead cells covers the delicate growing tip, known as the root-cap. This cap protects the delicate tip-cells as the root burrows through the soil, and it is renewed from beneath as fast as it is worn off on the outside. To aid roots in absorbing, the epidermal cells just behind the root-cap send out long hair-like processes known as root-hairs, which immensely increase the absorbing surface. These root-hairs are very ephemeral, being present only near growing tips and rapidly disappearing from older parts. It is only the youngest roots which have this typical root-structure and do the work of absorption. As a root increases in age, it becomes very much modified in its structure and ceases to absorb, being then merely a channel through which the absorbed material passes to the stem and leaves. JOHN M. COULTER.



Root-tip, showing root-cap (*c*) and young root-hairs (*h*).

Root-Cap. See ROOT.

Root, Elihu, an eminent American lawyer and statesman, was born at Clinton, New York, Feb. 15, 1845. Soon afterwards his father removed to Seneca Falls where he was principal of the academy of that place, returning to Clinton in 1850 to accept the professorship of mathematics and astronomy in Hamilton College. Root entered Hamilton College, and graduated in 1864. Entering New York University Law-School in the autumn of 1865, he graduated two years later and immediately began practice in New York City. In 1882 he was appointed United States District Attorney in New York City and was delegate-at-large to the state constitutional convention and chairman of the judiciary committee in 1894. He was appointed Secretary of War by President McKinley on Aug. 1, 1899, and on March 5, 1901, he was re-appointed. He was retained by President Roosevelt until Feb. 1, 1904, when he resigned to resume the practice of law in New York City. As Secretary of War he planned the new War-College at Washington; a modification of the rules of promotion of officers by which seniority ceased to be the sole requisite and the institution of the general staff in the United States Army. He prepared the documents for the government of the Philippine Islands, Porto Rico and Cuba, and so satisfactory were they that little was left for Congress to do but to give them legislative enactment. He was acting president as well as Secretary of State *pro tempore* during much of the Boxer troubles, and ordered General Chaffee to the rescue of the American legation at Peking. He also was one of the American members of the Alaskan boundary-commission in 1903. When, in 1905, the Secretaryship of State was made vacant by the death of John Hay, he was again called into public service. Mr. Root accepted as finished the most of the work of his eminent predecessor and struck out into a line until then much neglected. He at once began a serious study of our commercial relations with foreign nations and especially with the nations of the American continents. He prepared a measure for the reform of the consular service and succeeded in securing its passage by Congress. He organized the first Pan-American Congress in Rio Janeiro where the message of the United States to every American republic conveyed in his address has done immense service in dispelling misunderstandings and allaying suspicions. From 1909 to 1915 he was U. S. Senator from New York. As president of the convention at Albany in 1915 to remodel the State Constitution he was mainly responsible for its work, the most important feature of which was the proposal to reduce the number of elective state officers (over 150) into a few groups each headed by responsible officials with the governor as the center of power —this system to take the place of government by the type of party leaders known as political "bosses." The measure, however, was defeated.

Root, George Frederick, an American musical composer, was born at Sheffield, Mass., Aug. 30, 1820, and, after studying music a year in Paris, returned to write numerous popular songs, among which are *Music in the Air, Battle-Cry of Freedom, Just before the Battle, Mother, Tramp, Tramp, Tramp, the Boys are Marching.* He also pro-

duced a *Te Deum* and other more pretentious pieces. He received the doctorate from Chicago University in 1892. He died on Aug. 6, 1895.

Root-Hair. See ROOT.

Root-Pressure. When plants have their roots in a warm soil and the parts in air are not losing much water (whether because the leaves are not yet formed or because the moisture or coolness of the air do not permit evaporation), the roots may absorb water so rapidly (see ABSORPTION) that it distends the cells and escapes into the conducting tissues under the elastic pressure of the stretched cell-walls. (See TURGOR.) By this pressure it may be driven through the conducting tissues to some distance above the ground, and may well out at a wound. Late-pruned grape-vines "bleed" in this way, and much of the so-called dew on a lawn is water which has exuded from the leaves on account of root-pressure. Many leaves have special openings (water-pores) which permit the escape of water at times. But when evaporation is rapid, root-pressure falls to zero or becomes negative; while, therefore, it may assist in supplying water to leaves, it fails when the need is the greatest, and cannot be an important agent in the ascent of water. See WATER, ASCENT OF.

Root'stock', an underground stem, usually horizontal and much thickened by the storage of reserve food. That the structure is a stem may be recognized by the fact that it often bears reduced leaves. It really is the primary shoot of the plant, and sends out its branches or leaves above ground. An equivalent word is rhizome.

Root-Tubercles (*tū'bĕr-k'ls*). On the roots of many leguminous plants, as the clovers, little wart-like outgrowths frequently occur, known as root-tubercles. It is evident that these are occupied by bacteria, which swarm in them and doubtless obtain food from the roots of the host. These bacteria have the peculiar power of laying hold of the free nitrogen of the air circulating in the soil and of supplying it to the plant in some usable form. This habit of clover and its allies explains why they are useful in what is called restoring soil. After ordinary crops have exhausted the soil of its usable nitrogen salts and it has become relatively sterile, clover is able to grow by obtaining nitrogen from the air by the root-tubercles. If the crop of clover be plowed under, the nitrogenous material thus organized is contributed to the soil, which is thus restored to a condition which will support the ordinary crops again.

Ropes are usually made of vegetable fibers, and differ from twine only in their greater thickness. The fiber in most constant use is hemp, though ropes are also made of manilla or wild plantain and of wire. Coir fiber from the husk of the cocoanut is another important rope-making material, which has the advantage of being lighter than either hemp or manilla. Sisal hemp from South America is also used to a considerable extent, especially for ropes of small size, and for many purposes cotton-ropes are also employed. Notwithstanding the extensive use of machinery in the manufacture of ropes, the old process of rope-walk spinning is still practiced on a considerable scale. The successive stages in this process are (1) hackling the fiber; (2) spinning the yarn; (3) tarring in "hauls," consisting of about 300 yarns; (4) winding the yarn on bobbins and mounting these on bobbin-frames; (5) forming the strands; and (6) laying the strands into a rope. As life and property depend to so great an extent on the efficiency of ropes, great care and ingenuity have been exercised in the manufacture, causing many improvements to be devised for increasing their strength. Among these is the introduction of wire-ropes, which are extensively used in rigging ships and for other purposes These are generally made of iron wire, sometimes but not always galvanized. The twisting is done in the same way in which the strands of a hempen rope are laid together.

Rose. The well-known name of the genus *Rosa* and the type of a great family of plants.

THE AMERICAN-BEAUTY ROSE

It is one of the most prized of the cultivated ornamental forms, and is distributed over the whole temperate and subalpine region of the northern hemisphere. Over 200 species have been described, only about 15 or 20 of which occur native to North America. The varieties in cultivation are almost innumerable, both those which are hardy and those adapted for culture under glass.

The great beauty of the rose, its fragrance and its color have made it perhaps the most popular of all flowers, and yet it is

one of the most difficult to cultivate in this country. It has been said that the garden-rose does not thrive in America as it does in Europe; yet under the skill of our horticulturists gratifying results have been secured. Hot sun and the frequent droughts that occur in our climate are the chief obstacles to the full development of the bloom. An authority says: "The rose-garden must not be in an exposed situation; it must have shelter, but it must not have shade. No boughs may darken, no drips may saturate, no roots may rob the rose. There must be a rich, strong soil of clay or loam, and the ground must be well-drained." It is by cultivation under glass in green-houses that the greatest success has been obtained. The great demand for choice roses has led to an enormous increase in the erection of commercial green-houses, especially near the large cities. There are so many obstacles to successful rose-culture, arising from climatic conditions, insect-enemies etc., that one of the many manuals issued should be consulted by anyone who undertakes the culture of this beautiful flower.

Rose'bery, Archibald Philip Primrose (Earl of), was born at London, May 7, 1847, and, after being educated at Oxford, succeeded his grandfather as fifth earl in 1868. In 1874 he was chosen president of the Social Science congress, and in 1880 was elected lord-rector of Edinburgh University. On public platforms throughout the country Lord Rosebery is welcomed as an effective and entertaining speaker, and, although a peer of the realm, enjoys in an unusual measure the good-will of the whole of the democracy. In 1886 Lord Rosebery became secretary for foreign affairs in Mr. Gladstone's cabinet. In 1894–95 he was prime minister. He is a strong imperialist, though a Liberal in politics. He has published *Napoleon Bonaparte* and *Sir Robert Peel.*

Rosecrans (*rō'zĕ-krănz*), **William Starke,** an American general, was born at Kingston, Delaware County, O., Sept. 6, 1819, and, after graduating at West Point in 1842, served in the army as an engineer until 1854. Being commissioned brigadier-general of volunteers in 1861, he rendered efficient service in McClellan's West Virginia campaign. When the latter was appointed commander of the army of the Potomac, Rosecrans was left in command in West Virginia. After the evacuation of Corinth by the Confederates in 1862, he was placed in command of the army of the Mississippi; and in this capacity defeated Gen. Sterling Price at Iuka on the 19th of September, and a few days later successfully defended Corinth against Price and Van Dorn. He was then made commander of the army of the Cumberland; and on the first and second days of January, 1863, fought the battle of Stone River, Tennessee, in which his army won a substantial victory, although with great loss; but at Chickamauga in the following September he was defeated by Bragg, with a loss of over 16,000 men, the army being saved from complete destruction by the heroic valor of Gen. George H. Thomas. Rosecrans was superseded by General Grant

GENERAL ROSECRANS

a short time after this battle, but in 1864 was placed over the department of Missouri and repelled Price's invasion of that state. He resigned his position in the army in 1867, and was appointed minister to Mexico by President Johnson in 1868, and was a member of Congress from California from 1881 to 1885. In the latter year he was appointed registrar of the United States treasury by President Cleveland. He died near Los Angeles, Cal., March 11, 1898.

Ro'ses, Wars of the, a struggle between the houses of York (White Rose) and Lancaster (Red Rose), which desolated England from the battle of St. Albans in 1455 to that of Bosworth in 1485. The house of Lancaster came to the throne when Henry IV, son of John of Gaunt, compelled his cousin, Richard II, to resign the crown in his favor in 1399. Henry IV was succeeded by Henry V, his son, in 1413 and he by Henry VI, his son, in 1422; but during the reign of the latter Richard, duke of York, began to advance his claim to the throne. In 1454 Richard was appointed protector of the realm during Henry's insanity, and on the king's recovery soon after took up arms against his rival Somerset, and defeated and crushed him at the battle of St. Albans. But such was the weakness of Henry's administration and such the unpopularity of his queen (Margaret of Anjou), that the earls of Salisbury, Warwick and March rose against him, defeating and capturing him at Northampton in 1460. The active and ambitious queen passed swiftly to the north, and in the battle of Wakefield the duke of York was defeated and slain; but his son Edward gained decisive victories over the queen's forces at Mortimer's Cross and Towton (1461), after which he was crowned king

at Westminster as Edward IV. A few years after Edward became king, the earl of Warwick, who had been one of his most active adherents, took offense at his marriage with Elizabeth Woodville and formed an alliance with Queen Margaret, on account of which Edward was compelled to leave England for a time, and Henry VI was once more invested with the royal authority. But Edward returned in 1471, defeated and slew Warwick at Barnet, and defeated the queen at Tewkesbury. The murder of Prince Edward, Henry's son, after the battle and the death of Henry himself in the Tower (1471) left Edward to reign in peace until 1483, when he died and was succeeded by his son Edward V, the unfortunate prince who, with his brother Arthur, was murdered in the Tower by order of his uncle Richard III. Richard's reign, however, was a short one, as he was defeated and slain at the battle of Bosworth in 1485 by the earl of Richmond, who then became King Henry VII.

Roset'ta Stone, a slab of black basalt (now in the British Museum, London), found by some French engineers, in 1799, near Rosetta, a town on the delta of the Nile, and famous as having furnished the first key for the interpretation of Egyptian hieroglyphics. Despite its present mutilated appearance, it has been judged that the slab was erected in honor of one of the Ptolemies in 196 B. C. On it are carved three equivalent inscriptions — the first in hieroglyphics (or picture-writing of a sacred character), the second in demotic (enchorial or epistolographic) characters, and the third in uncial Greek letters. The mutilations have destroyed a considerable portion of the inscriptions. In its present broken condition the stone measures three feet nine inches in height, two feet four and one half inches in width and eleven inches in thickness.

Ros'in. See RESIN.

Ros'lin, a Midlothian Scottish village, near the wooded glen of the North Esk, seven miles south of Edinburgh. Its castle was the seat of the St. Clairs, earls of Orkney from 1379 to 1471, afterwards earls of Caithness and hereditary grandmaster-masons of Scotland from 1471 to 1736. The exquisite chapel, built about 1446, was much damaged by an Edinburgh mob in 1688, but was restored by the third earl of Rosslyn at a cost of $25,000, and since 1862 it has been used as an Episcopal church. Its Spanish pillar is a marvel of beauty. On Roslin Moor the Scots are said to have twice defeated the English in one day — Feb. 24, 1303.

Ross, George W., was born in Middlesex County (Ontario) in 1841. He became a teacher and inspector of schools and was elected to the House of Commons (Canada) in 1872. In 1883 he was elected to the Legislature of Ontario. He was appointed minister of education in 1883, and held this position until 1899. He became premier of Ontario in that year, accepting the portfolio of treasurer, which he resigned in 1905. Appointed to the Senate of Canada in 1906, he stands in the first rank of public men as debater and lecturer.

Ross, James Clark, British navigator, nephew of Sir John Ross, was born at London, April 15, 1800, and died near Aylesbury, England, April 3, 1862. In June, 1831, he determined the approximate position of the northern magnetic pole. In 1839–43 we find him in command of the *Erebus*, which, with the *Terror*, roamed the antarctic seas and reached the furthest southern latitude hitherto explored (78° 10′ S.). On this voyage Mt. Erebus was discovered and named, the volcano having a height of 13,000 feet. He also discovered icebound Victoria Land. Subsequently Ross was honored with knighthood, and published *A Narrative of the Antarctic Regions.*

Ross, John, British navigator and Arctic explorer, was born in Scotland, June 24, 1777, the son of a minister of Inch, Wigtownshire, and was little more than nine when he entered the navy, serving with distinction in the French wars. His most important services were rendered in the arctic regions in 1818 as second in command under Commander Parry, the object of the expedition being to explore Baffin Bay and attempt a northwest passage. In 1829 he commanded an expedition to the arctic regions, fitted out by Sir Felix Booth, and discovered the peninsula of Boothia Felix. In 1850 he made yet another voyage to the polar regions — an unsuccessful attempt to find Sir John Franklin. He died at London, Aug. 30, 1856.

Rossetti (*rôs-sĕt'tē*), **Christina Georgina,** a prominent modern English poet, sister of Dante Gabriel Rossetti, was born at London, Dec. 5, 1830, and died on Dec. 29, 1894. She was of Italian origin, daughter of Gabriele Rossetti, a well-known commentator on Dante, and began early to write verse. Her mood was religious and reflective, though inclined somewhat to mysticism, and she had a woman's soulfulness, insight and grace. Her chief productions are *The Prince's Progress, Goblin-Market and Other Poems,* with a volume of children's stories, entitled *Speaking Likenesses,* and a collection of nursery rhymes, entitled *Sing-Song,* etc. See *Memoir* by Ellen A. Proctor, edited by W. M. Rossetti.

Rossetti, Dante Gabriel, English painter and poet, was born at London, May 12, 1828, and died near Margate, April 9, 1882. His first picture was *The Childhood of the Virgin* (1849). About this time Rossetti joined Hunt, Millais and others in forming the Pre-Raphaelite Brotherhood. This coterie powerfully influenced modern art. Rossetti early showed genius in poetry as well as in painting. His literary work con-

sists of *The Earlier Italian Poets* (translated in the original meters), *Poems* and *Ballads*. All rank high; in fact, competent critics rank his poetry much higher than his painting, as he never adequately reached the mere technique of his art. He painted both in oil and in watercolor. His subjects were taken from medieval legends, especially from those about King Arthur, and from ancient ballads. Among his principal pictures are *Dante's Dream, Dying Beatrix, Sibylla Palmifera* and *The Blessed Damozel*. His reputation as a painter rests mainly on the enthusiasm of the critics, "few but fit," who have seen his pictures in private collections. Consult Benson's *Rossetti* in the English Men of Letters Series and W. M. Rossetti's *Memoirs*. See PRE-RAPHAELITISM.

Rossetti, Gabriele, a celebrated Italian author, was born at Vasto in the kingdom of Naples, Feb. 28, 1783, and at an early age was placed by the Marchese del Vasto to study in the University of Naples. His boyhood and youth were in a time of great political commotion; and in 1824 he went to London as a political refugee. In that city he lived a quiet and studious life. Among his works was a commentary on Dante (*q. v.*), in which he tried to show that the works of that great poet were antipapal in their hidden meaning and that Beatrice was a symbolic personage, not a real woman. Rossetti's views in reference to Dante excited a controversy that has not ceased His memory is much revered in Italy, especially in his native town, where the house of his birth has been purchased as public property, and a theater and the chief public square have been named after him. He died at London, April 26, 1854.

Rossini (*rŏs-sē'nē*), **Gioacchino,** a great Italian operatic composer, was born at Pesaro on Feb. 29, 1792. At 15 he was sent to study at the Lyceum of Bologna. His first important opera was *Tancredi* (1813), which immediately raised him to honor and fame. In 1823 he produced *Semiramide*, the most gorgeous of his operas, in Venice, after which he visited Paris and London, at both of which he was received with the greatest enthusiasm. Being appointed director of the Italian opera in Paris, in 1829 he produced his greatest work, *William Tell*, which was conceived and written in a style very different from his Italian operas and more in conformity with modern dramatic ideas. With the exception of his well-known *Stabat Mater*, he may be said to have closed his career with *William Tell*, large offers from the managers of opera-houses failing to draw him from his retirement. He died at Paris, Nov. 13, 1868. See biography by H. S. Edwards and *Life* in the Great Musician Series, by the same author.

Ross'land, Can., the center of the important mining district of the West Kootenay, lies six miles north of the international frontier in British Columbia, and has a population of 6,159, which is being rapidly augmented. Gold, silver and copper in marked abundance underlie the countryside about, and its prosperity and growth are assured.

Rota'tion of Crops refers to the growth of two or more different kinds of farm-crops in regular order during successive years. It is practiced primarily to keep up the fertility of the soil and, incidentally, to keep down weeds. Available plant-food is being continually added to the soil by the decay of its mineral constituents. (See SOIL.) But a crop needing more of a given substance than is naturally made available will, in time, use up the surplus already accumulated. The value of crop-rotation depends upon the facts (1) that not all plants use the same amounts of the plant-foods in the soil, though but five per cent. of the total plant-body comes from this source; (2) that they get their mineral foods from different depths of the soil by having roots of different lengths; (3) that some plants can use mineral food in a less advanced stage of decay than can others; (4) that some crops with large root-systems leave much vegetable matter in the soil after harvest to change its physical properties (see CAPILLARITY); (5) that the extra cultivation required by some farm-crops to save the soil-moisture operates also to keep down weeds and insect-pests or to clean out such as have gotten a foot-hold while another crop was growing; (6) that leguminous crops bring about a positive addition of nitrogen, which is most likely to be lacking (see NITROGEN-GATHERING CROPS); (7) that different crops, by ripening at different times, serve to simplify the farm-labor problem; and (8) that the resulting diversified farming minimizes the financial loss from climatic conditions that are apt to hurt one crop more than another. Some of the most approved systems of crop-rotation are here given: In the central states a four-year rotation-series of clover, corn and oats or potatoes, followed by wheat; in the higher latitudes, as the wheat-belt of the northwest, a crop of corn or potatoes or even a summer fallowing after two or three crops of wheat and flax. In such a four-year rotation three crops of wheat yield as much as would four without rotation being practiced. When the soil lacks nitrogen, clover or alfalfa should find a place in the series. In the southern states a specially recommended series is cotton, corn, oats and cowpeas, distributed over three years, in which oats, sown in the fall, will be followed by cowpeas the next spring. Peas are also sown between the cotton rows. Consult Roberts's *The Fertility of the Land* and the U. S. Dept. of Agriculture's Year-book for 1902: *Practices in Crop-Rotation*.

Rothschilds (*rŏths'childs*), the well-known family of bankers, take their name from the sign of the house (*Zum Rothen Schilde* or

The Red Shield) in the Jews' quarter of Frankfort, in which their ancestors lived. The founder of the great banking-house was Mayer Anselm Rothschild, who was born in 1743 and died in 1812. Although educated to become a Jewish rabbi, he began his career in the banking business at Frankfort, and so won the confidence of the landgrave of Hesse, that he was intrusted with the management of that prince's finances. There is a story that he hid the treasures of the landgrave, amounting to more than $5,000,000, from the French invaders of 1806, and was allowed the free use of the money for several years, thereby laying the foundations of his great fortune. Whether this be true or not, his business soon immensely prospered, and the house became a financial power that was felt by all the governments of Europe. Before the senior Rothschild's death he saw his five sons established as financial kings in the principal capitals of Europe — Anselm in Frankfort, Nathan in London, Solomon in Vienna, James in Paris and Charles in Naples. Nathan is said to have known the result of the battle of Waterloo several hours before the English government, and the knowledge was worth $1,000,000 to him. He was succeeded by his son Lionel, who distinguished himself by his efforts to secure the removal of the civil disabilities to which the Jews were formerly subject in England. See *The Rothschilds* by Reeves.

Rotifers (*rō'tĭ-fĕrs*), a class of minute worms abundant in fresh water. They are also found in damp moss and in the sea. They are often called wheel-animalcules, on account of the wheel-like appearance presented by the rapid movement of cilia on the front part of their bodies. The movement of these cilia produces a minute whirlpool in the water, in which the particles of food are conveyed to the animal's mouth. Although so minute and presenting a general resemblance to *Infusoria* (*q. v.*), they nevertheless are many-celled animals of complicated construction. They have a nervous system and other sets of organs distinctly developed. They are favorite objects with amateur microscopists. See Gosse's *Evenings with the Microscope.*

Rotterdam (*rŏt'tĕr-dăm*), the busiest port of Holland, stands on both sides of the Maas, 20 miles from its mouth and 45 from Amsterdam. Its trade has grown rapidly since Belgium separated from Holland, especially since the middle of last century. In 1888 the quays measured 15 miles in length, and the docks covered nearly 200 acres. Since then two new docks have been constructed, and the wharves have been extended. More than 50 per cent. of the vessels that enter the various ports of Holland (estimated by their tonnage) enter at Rotterdam. The total tonnage entering Rotterdam yearly amounts to 7,500,000 tons. From this port 5,000 to 15,000 emigrants sail yearly to the United States and other countries. Rotterdam counts among her famous sons Erasmus and Tollens the poet. Population 417 780.

Rouen (*rōō'ăn'*), formerly the capital of Normandy and, after Lyons, the chief manufacturing city of France, is situated on the right bank of the Seine, about 90 miles from Paris by rail. The modern streets are well and regularly built; but a considerable part of old Rouen still remains. The Seine makes Rouen, although 80 miles from the sea, the fourth shipping-port of France, and extensive improvements in deepening the river and building wharves yearly add to its capacity and importance. Its total trade exceeds $50,000,000 a year. William the Conqueror died at Rouen in 1087. During the wars of Henry V and Henry VI of England it was subject to the English from 1419 to 1449, when it was retaken by the French under Charles VI. During its occupation by the English Joan of Arc was burned alive in the square of the city in which stands her statue. Population 124,987.

Rouge River, Quebec, Can., waters a fertile and well-wooded plain, runs from north to south, and has its principal source in a series of lakes between Joliette and Montcalm Counties. Its principal branch flows into the Ottawa between Grenville and Pointe du Chene. Timber can be floated throughout its entire length.

Rough Rid'ers. The original rough-riders were the men who carried messages through the western states before the organization of the pony-express in 1859 The name was used by William R. Cody who, in his Wild West show, had a congress of the rough riders of the world. In the Spanish-American war Congress authorized the raising of a cavalry regiment from among the wild riders and rifle-men of the Rockies and Great Plains. The mustering-places for the regiment were appointed in New Mexico, Arizona, Oklahoma and Indian Territory, and the men were to gather at San Antonio, Texas. The regiment was given the official title of the First United States Volunteer Cavalry, and Dr. Leonard Wood was placed in command with the rank of colonel and Theodore Roosevelt was made second in command with the rank of lieutenant-colonel. Seven hundred and eighty men were originally allotted, but the number was soon raised to 1,000. Men from all parts of the country and from almost every walk in life and social position were eager to enlist. Indians, half-breeds, cowboys, miners, ranchmen, college-athletes and New York and Boston club-men were numbered among those enlisted. The uniform adopted was a slouch-hat, a blue flannel-shirt, brown trousers, leggings, boots and a large handkerchief knotted loosely around the neck. In spite of protests of commanding officers they

were promptly christened The Rough Riders, which name they since bear with pride. Among the first to be ordered to the front and brigaded with the First and Tenth Regular Cavalry under Brigadier-General Young, they played an important part in the Santiago campaign in which took place some of the hardest fighting of the Spanish-American War. Before disbanding in 1898 a Rough Riders' Association was formed, to which members of the regiment are eligible, the right to membership to descend to the oldest son.

Round Table, The, a table, according to Arthurian tradition, designed by Merlin, a Welsh sage and enchanter of the 5th century, for Uther Pendragon, a British king, to seat 50 knights at feasts. According to the legend, these knights were to be distinguished for piety, courage and fidelity; they originally formed a military order known as The Knights of the Round Table, but the organization also became a theocratic one. As they gathered round the table, the seat was reserved (styled the seat-perilous) for the knight of their number, or who was afterwards to appear, whose achievement of the Holy Grail was certain. In due time the vacant seat was filled by the Arthur of romance, a brave, virtuous and accomplished knight, whose exploits fill all the poetry of the middle ages. He was the son of Uther Pendragon by Igerna, and was educated and instructed by Merlin, who figures in Spenser's *Faërie Queen*, in the tales and romances of medieval chivalry and in Tennyson's *Idyls of the King*. Arthur woos and weds Guinevere and makes her his queen; he has, however, to wage war for her with Sir Lancelot (son of the king of Brittany and one of the knights of the Round Table). Much of the legend of this knight (who was father of Sir Galahad by Elaine) has to do with his (Lancelot's) guilty love for Guinevere and with the exploits he performed in her service. The Round Table is fabled to have been constructed in imitation of the one which Joseph of Arimathea established in imitation of that used at the Last Supper. According to another tradition, Arthur himself established the Round Table at York and founded at Winchester his order of knighthood.

Rousseau (*rōō'sō'*), **Jean Baptiste,** a great lyric poet of France, was born at Paris, April 16, 1670, the son of a shoemaker. When quite young he began writing pieces for the theater which were unsuccessful. In 1712 he was banished for failing to make good a charge of libel brought against a fellow writer, and spent the remainder of his life abroad, a part of the time in Switzerland. At Brussels he became acquainted with Voltaire, who first was his friend and then his enemy. His sacred odes and songs, and especially his epigrams, took high rank. Rousseau died at Brussels, March 17, 1741

Rousseau, Jean Jacques, a noted Swiss-French philosopher, was born at Geneva, June 28, 1712. In 1741 he set out to make his fortune at Paris. Here he lived in a dirty, shabby inn, earning a livelihood by copying music. Here he met Thérèse le Vasseur, who lived with him the remainder of his life. He wrote for Diderot's *Encyclopedia*, but first came into notice through his *Discourse on Arts and Sciences*, which won a prize. His independence of thought and the freshness of his brilliant style made him celebrated and welcome in society. In 1753 he brought out a successful opera, full of sparkling airs, one of which is the well-known hymn-tune: *Rousseau's Dream*. In 1760 his romance of *The New Hélōise* was at once received with applause. Two years later came the *Social Contract* and *Émile*. The first of these three works raised Rousseau to the first rank as a writer of romance; the second, as a political socialist; the third, as a writer on education. His *New Hélōise*, by its passion, influenced the society and literature of France, Italy and Germany, and its idyllic pictures and fine descriptions touched the fashionable world with a love for country life and simple ways; while the whole book was a lesson on the rights of the poor and the duties of the rich. The *Social Contract* taught that no laws are binding unless agreed upon by all the people, and Rosseau's "liberty, equality and fraternity" became a war-cry of the French Revolution. His ideas on children's training, set forth in *Émile*, were used by great teachers like Froebel and Pestalozzi, but in a part of the book he showed himself a deist in religion, and horrified the church as much as he disgusted such men as Voltaire and D'Alembert. He was denounced by the archbishop of Paris, his book burned, and himself ordered under arrest. He fled the country, and for a while was given a home by the historian Hume in England, where he wrote his famous *Confessions*. His trials and broken health had made him senselessly suspicious. He distrusted his best friends, and was sure that the English government sought his life. So he soon went back to France, living in various places provided by his friends, and wrote his *Reveries*. His delusions increased, so that everywhere he felt that he was watched by spies, and hated even by the children on the streets. He died near Paris, July 2, 1778. See Morley's *Memoir*.

Rousseau, Lovell Harrison, American soldier, was born in Kentucky, Aug. 4, 1818. He fought in the Mexican War under General Taylor, and on his return practiced law in Louisville. In the Kentucky senate during 1860 he opposed secession, and later raised two regiments of Union men. In 1861, as brigadier-general, he fought in Buell's army at the battle of Shiloh, April 7, 1862. He was in the battle of Perryville, Ky., Oct. 8, and at Murfreesboro, Dec. 31,

of the same year, and for gallantry was promoted to the rank of major-general. In November, 1863, he was appointed to command the district of Tennessee, resigning two years later. When Alaska was purchased in 1867, he was assigned there as brigadier-general in the regular army, and in the year following was transferred to the command of the department of Louisiana. He died at New Orleans, Jan. 7, 1869.

Rousseau, Pierre Étienne T., a prominent landscape-painter of France, was born at Paris, April 15, 1812, the son of a tailor. A kinsman, himself a painter, saw a landscape the boy had painted when 14, and persuaded his parents to have him study art instead of engineering, as they had intended. However his best teachers were not the artists to whom he was sent, but the old masters in the Louvre, while his happiest hours were spent in sketching from nature in the country around Paris. Some of his best pictures were rejected by the *Salon*, and for many years he struggled against neglect and discouragement. But later his worth was acknowledged, and he was made an officer of the Legion of Honor. Among his best landscapes are *The Alley of Chestnut-Trees* and *Early Summer-Morning*. He died near Fontainebleau, Dec. 22, 1867. See D. C. Thompson's *The Barbizon School*.

Rowan Tree (*rō'ăn*). See ASH.

Row'land, Henry Augustus, easily first among American physicists, was born at Honesdale, Pa., on Nov. 27, 1848, and died at Baltimore, Md., April 16, 1901. He received his education — if we may speak of such a genius as having received anything in education, other than what he worked out for himself — at Rensselaer Polytechnic Institute in Troy, where he graduated with the degree of civil engineer in 1870. During 1871–2 he taught science at Wooster College in Ohio. From 1872 to 1875 he taught physics at his alma mater in Troy. During these three years he prepared a very important paper on some problems in magnetism which at once gave him a reputation in Europe. In 1872 he was selected by President Gilman as one of the original staff of Johns Hopkins University. He, however, was immediately given a year's leave of absence, and in 1876, at Helmholtz's laboratory in Berlin, he made one of the most important electrical discoveries of modern times: *Electric charges when put into rapid motion exert magnetic forces exactly as do the equivalent electric currents.* The story of his work during the next quarter-century at Johns Hopkins University is too long for recital here. Suffice it to say that within a few years his researches on the mechanical equivalent of heat; the value of the absolute unit of electrical resistance; the diffraction-grating; the spectra of the elements; and the solar spectrum won distinction and honor for him from all the more important learned societies of the world. Among his greatest discoveries must be mentioned the curved grating which is the essential part of the most powerful form of spectroscope known, and does not involve in its construction any lenses. His printing, multiplex telegraph, on which he was at work at his death, formed one of the most interesting exhibits at the Paris exposition and has recently been adopted by the German government.

President Gilman says of him: "He knew how to ask a difficult and far-reaching question, and he knew how to seek the answer. Extraneous considerations were excluded when he saw the point of an inquiry, and on that point he concentrated all his powers. For example, when he began the brilliant series of experiments in spectrography, which made him peerless in this domain, he saw that the spectrum depended on the accuracy of the gratings, the gratings on the dividing-engine and the dividing-engine on the screw; so he began the study of light by devising and making a screw more exact than any screw that has ever been produced by the most accomplished makers of instruments of precision." For details of his work see sketch by Professor Ames in *Astrophysical Journal*, May, 1901, and another by Prof. H. F. Reid in *American Journal of Science*, June, 1901.

Royal Canadian Academy, The, was founded by the Marquess of Lorne and the Princess Louise in 1880, L. R. O'Brien becoming its first president. Nearly every native artist of established repute is a member, and the younger men of promise have largely been admitted as associates. Wherever exhibits of international moment have been given since its foundation, its members have been able to carry off prizes in the face of the competition of the world, notably at Chicago, Buffalo and St. Louis.

Royal Military College. During the session of the Canadian Parliament of 1874 the minister of militia, with the sanction of Premier Alexander Mackenzie, introduced a bill providing for the establishment of a military college resembling those at Sandhurst (England) and West Point (United States). Instruction in subjects bearing on military matters was to be imparted by officers from the Imperial Army, and the teaching staff was to include instructors in French, engineering and other subjects. From this act of Parliament has grown Canada's Royal Military College. Its fine buildings are picturesquely situated on the lake-shore east of Kingston (Ontario) on the same point of land as Fort Frederick. Fort Frederick and Fort Henry give a military atmosphere to the neighborhood and are used as object lessons in military tactics and maneuvers in the training of the cadets. The college opened in 1876 with a class of eighteen. The first commandant was Lieutenant-General E. O. Hewett. He remained

in charge until 1886, and upon resigning was thanked by the government for his successful administration of the affairs of Royal Military College. Graduates of the Royal Military College obtain positions in the Imperial Army and Canadian forces. Cadets must pass a competitive examination on entering, and are required to take yearly examinations afterwards in order to obtain diplomas. Although the college is organized on a strictly military basis, thoroughly practical and complete courses of study in other subjects are given. These courses include such subjects as civil engineering, civil and hydrographic surveying, physics, chemistry, and the study of French and English. The constant practice of gymnastic drills, riding and outdoor games and exercises of all kinds ensure good health and fine physical condition to the young men attending the college. Seven commissions in the Imperial Army are awarded yearly to the cadets who stand the highest. The length of the course is three years, which are divided into three terms of nine and a half months' residence each. The total cost of the course, including board, uniform, tuition, books, laboratory equipment and all extras, amounts to about $900.

Royal Society of Canada, The, was founded by the Marquess of Lorne in conjunction with the leaders of thought in the Dominion, and its first meeting took place at Ottawa in 1882, Sir William Dawson presiding. Only 80 members are elected, divided into sections numbering 20 each. The first is devoted to French-Canadian literature and history, the second to English-Canadian literature and history, the third to mathematical, physical and chemical science and the fourth to geological and biological science. Meetings are held yearly in May, usually at Ottawa, and the transactions, filling a large volume, are published annually at governmental expense.

Rub'ber Man'ufac'ture. In a number of different kinds of tropical trees is found a secretion that does not seem to be essential to the life of the tree, in which float minute globules of rubber. Many methods of securing this secretion, usually called rubber-milk, are employed; but the most common and economical way is to make incisions in the trunk of the tree. As the rubber-milk flows out, it is caught in a small cup of clay and at the end of each day emptied into a larger vessel. The old and still common way of separating the small globules of rubber from the rubber-milk is by evaporation. Where rubber-milk is collected in large quantities, however, a machine similar to a cream-separator is used. This collects the rubber on the top and drives the water and all impurities to the bottom. The manufacture of rubber began about 1820. The application of rubber to making waterproof cloth first gave commercial importance to rubber. The first to make this application of rubber was Charles McIntosh, who reduced it to a solution in naptha and spread it between two pieces of cloth. Waterproof coats still bear his name. Williams Chaffee developed a rubber-varnish for coating different materials to make them waterproof. The Roxbury Rubber Company was formed in 1833, and for a time did a flourishing business, but it was soon found that the articles manufactured had a tendency to harden and crack in winter and become soft and sticky in summer. In the meantime Charles Goodyear was trying to overcome this defect by mixing pure rubber with various other substances. Nathaniel Hayward of Woburn, Mass., found that by mixing dry sulphur with pure rubber the stickiness was removed. Goodyear acquired Hayward's patent. By accident he dropped some of the mixture on a hot stove and found that it did not melt. He then placed it in extreme cold and found that its texture was not changed. Thus the art of vulcanizing rubber was discovered, for the process consists simply of mixing sulphur with pure rubber and then subjecting the mixture to moderate heat for a period of time. The mixture varies from soft to hard according to the amount of heat applied. Although sulphur is the only essential ingredient, others, as asphalt, carbonate of lead, magnesium, silicate or tar, are often added, each of which imparts a different quality to the product. Pure rubber is now used only to a limited extent in arts, but in its vulcanized state it is applied to an almost endless variety of purposes.

Ru'bens, Peter Paul, a celebrated painter of the Flemish school, was born at Siegen in Westphalia, June 29, 1577. In 1579 his father, who was a lawyer, died, and his mother went back to her native city of Antwerp, where young Rubens was taught at a Jesuit school. For a while he served as a page, but at 13 began to study art. In 1600 he went to Italy, studied the works of Titian and Paul Veronese, and became court-painter to the Duke of Mantua. In 1605 he was sent on a mission to Philip III of Spain and proved a good diplomat. At Madrid he painted the portraits of many of the nobility. He settled at Antwerp in 1609, and became court-painter to Archduke Albert. The same year he married his first wife, Isabella Brant, whose likeness he so often painted. Between 1611 and 1614 he painted his *Descent from the Cross*, which is usually thought to be his masterpiece. At Paris he painted over a score of pictures for the queen-mother, Marie de Medici, illustrating her marriage with Henry IV. Sent on a mission to Philip IV of Spain, he stayed nine months in Madrid, became acquainted with Velasquez, and painted some 40 pictures, among them five portraits of the king.

PEANUT
OLIVE
RUBBER TREE
NUT PALM
OIL PALM

He was also sent as envoy to Charles I of England to treat for peace. He accomplished his mission with great tact, and painted the portraits of the king and queen as well as other English pictures. He was knighted both by Charles I and Philip IV. In 1630 Rubens married his second wife, Helena Fourment, a beautiful girl of 16. The main features of Rubens' work are power, spirit and life. Reynolds said: "Rubens perhaps was the greatest master in the mechanical part of the art, the best workman with his tools, that ever used a pencil." In all, Rubens painted several thousand pictures. He died at Antwerp, May 30, 1640. See C. W. Kett's *Great Artists.*

Rubicon (*rụ'bĭ-kŭn*), a stream of central Italy, falling into the Adriatic, became famous from Cæsar's passage of it in the middle of January, 49 B. C., on his march on Rome. It formed the southern boundary of his province, so that by crossing it he really declared war on the republic. It is said that Cæsar hesitated a while on the bank and then crossed with the words: *Jacta est alea* (the die is cast). So "crossing the Rubicon" has come to be a proverb with reference to any decisive step.

Rubinstein (*rōō'bĭn-stīn*), **Anton Gregor,** composer and pianist, was born near Jassy, Rumania, Nov. 30, 1829, and died near St. Petersburg, Nov. 20, 1894. Early in life he became a pupil of Abbé Liszt at Paris, after which he gave a number of notable concert-tours, and by his compositions and playing created a sensation. In 1858 he became a director of the Russian imperial concert and later founded the St. Petersburg Conservatory of Music. He visited England and France a number of times, as also the United States. His compositions have lyric melodiousness and are characterized by much feeling and sweetness. He held deservedly high rank as a pianist, having a mastery of technique and manifesting great musical sensibility. He wrote about 20 operas, besides overtures, sonatas, concertos, symphonies and vocal pieces. In 1887 he was awarded the French decoration of the Legion of Honor, and in 1889 received a grand jubilee *fête* at St. Petersburg. In 1890 appeared his *Autobiography,* and later a *Conversation on Music* came from his pen.

Ru'ble or **Rouble,** a Russian coin, weighing in silver about 20 grams and equivalent to 100 kopecks. It is the legal unit of money throughout Russia, and is worth about 50 cents or two shillings English. Officially 9.47 roubles are equivalent to $5 gold or to the pound sterling. In the czar's dominions gold is coined into 10 and 5 rouble pieces equal to $5.30 (£1. 1 sh. 4*d.*) and $2.65 (10*s.* 8*d.* sterling). Besides the silver and gold roubles, credit-notes (paper-money) are legal tender of the denominations of 100, 25, 10, 5, 3 roubles, and 1 rouble.

Ru'by, a much-prized gem, is a pure, transparent, red-colored variety of corundum, sapphire being a blue variety of the same mineral. Corundum, which is aluminum oxide, forms the hardest of all gems except the diamond. Although usually red, yet pink, purple and violet rubies are found, but the most valuable are those of the color called pigeon's blood. The finest eastern rubies are more highly prized than diamonds of like size and quality. Those over a carat in weight are worth from $100 to $1,000 a carat, and no stone increases so much in value as it increases in size. But rubies perfect in color, transparency and freedom from flaw are much rarer than good diamonds. Rubies seldom weigh more than eight or ten carats, but Gustavus III of Sweden presented one to Catherine of Russia as big as a pigeon's egg. One owned by the king of Ceylon was, according to Marco Polo, a span long, as thick as a man's arm and without a flaw; Kublai Khan vainly offered a city for it. The finest rubies come from Upper Burma. Dark-red rubies are found in Siam and purplish rubies in Ceylon. Rubies are also found in the mountain region of Yunnan in China, in Afghanistan and in the basin of the Oxus. They have also been found in New Guinea, Victoria and New South Wales. Many of the so-called rubies of jewelers are varieties of spinel, a mineral softer than corundum and mostly made of alumina and magnesia. Artificial rubies are made which are used in watches, and for this purpose are equal to natural rubies. Although they are identical in composition and hardness with the natural stones, the use of them as gems is considered fraudulent. They may usually be detected by microscopic examination, since they generally contain minute bubbles.

Ruff, a bird allied to the sandpiper. It breeds in the north of Asia and Europe, and migrates southward as far as the Cape of Good Hope. It is found as a straggler in Iceland, in Canada and in some of the eastern states, and is sometimes shot on Long Island. The male bird, the ruff, is about a foot long. In the spring it sheds the feathers of the face; curled tufts of feathers appear on the sides of the head; and an erectile ruff grows which lasts two months. The ruff, as well as the feathers of the back, shows every variation of color in different birds, but each bird yearly regains its own peculiar color. The female, the reeve, is about one fourth smaller. The males fight for the possession of the females, and in battle the ruff serves for defense. The nest is made in the coarse grass of a hummock in a moist, swampy place. The four eggs are grayish green, marked with reddish brown. The birds eat insects, worms, seeds and rice. Rufis are often captured and fattened for the table.

Ruffini (*rōōf-fē'nē*) **Giovanni,** one of the foremost Italian novelists, was born at

Genoa about 1809. He was a fellow-student of Mazzini (*q. v.*), and helped him to organize his famous association, called Young Italy. In 1848 Ruffini was Sardinian ambassador at Paris, but next year he made his home in England. His novel of *Lorenzo Benoni* is based on his own life. His most famous book is *Doctor Antonio.* He died in 1881.

Rug'by, a town of Warwickshire, England, is 30 miles southeast of Birmingham. The gunpowder plot was hatched near here, and the battlefield of Naseby is not far. Its famous school was founded in 1567 by Lawrence Sheriff, a grocer and stanch supporter of Queen Elizabeth. Under famous Dr. Arnold the school gained a national reputation. Rugby is now, by all odds, the best school in England. Among its many well-known students were Landor, Clough, Matthew Arnold, Dean Stanley, Lord Derby, Mr. Goschen and Thomas Hughes, whose *Tom Brown's School-Days* is read by boys the world over. See Stanley's *Life of Arnold.* Population 16,830.

Rugs, Oriental. Rug-weaving is a very ancient art that is probably traceable to Egypt and Babylonia. Persia leads in the production of luxurious and beautiful rugs; thence the art spread to Greece, Arabia, Turkey, Afghanistan and India.

The rug in the orient is not only floor-covering but also wall-hanging, bedding and furniture. Not only was it a source of comfort in the home, but it had a prominent place in religious ceremonies and as temple, mosque and church decoration. The Mohammedan has his prayer-rug which he spreads and kneels upon at the hour of prayer, with the point of the design toward Mecca, the direction in which he bows his head. In the far east rugs are used as saddle-bags and trappings for camel and horses. Originally women were the only weavers. Where rugs are not made for the trade, as they are now in parts of Turkey, India and Persia, women still are the sole rug-makers. Each weaver had a special design which was frequently handed down, with few variations, for several generations.

The implements and materials of the rug-craft are very simple, consisting of two long poles hung horizontally on which the warp of cotton or hemp is strung, balls of the various colored yarns used in the design, a rude kind of comb for packing down the pile as it is tied around the warp-threads and a knife or shears for cutting and trimming the pile. An oriental rug is valued according to the number of knots to the square inch, some rugs having as many as 500 knots in a square inch. These knots are all tied by hand, and it is said that a good weaver can tie about three a minute, so that each rug of any considerable size must take years to make. The materials, beside the cotton or hemp warp, are silk, wool from the sheep or goat and camel's hair. The colors are of animal and vegetable origin, being obtained from indigo, madder, larkspur, saffron, henna, valonia and walnut husks, and are rich, brilliant and permanent. The men gather the dye-plants or cultivate them, work them into dye and dye the wool.

The designs of all but the Mohammedan rugs are both derived from nature and from geometric forms that are supposed to have some symbolic significance. The Mohammedan was forbidden by his religion to imitate any forms of nature; so he has been forced to invent designs that either are purely geometric or are extremely conventionalized suggestions of natural forms.

There are at least 14 varieties of Persian rugs, among which are Khorasan, Meshed, Herat, Shiraz, Kirman, Tabriz, Senna, Sarabband, Teraghan, Saruk, Herez, Hamadan, Sultanabad and Ispahan. The Shah of Persia in his palace at Teheran has a marvelous collection of antiques, among which is the carpet that belonged to the famous peacock-throne at Delhi. The climax of this art in Persia was the 16th century. Persian designs are characterized by a floral pattern.

The region of the Caucasus Mountains is prolific in the production of rugs, the art of weaving which was learned from Persia. Their design is pronouncedly geometrical, using the star, diamond-form, square and fretwork. The rugs listed as Caucasian are Daghestan, Cabistan, Tzitzi, Malgaran, Derbend, Kasak, Guenja, Kashmir, Shirvan and Karabagh.

The Kurds combine the designs of Persia and Caucasia in five kinds of rugs known as Persian Kurdistan, Turkish Kurdistan, Sarakhs, Mossoul and Khilim, the latter are without pile and closely woven in beautiful design and color. They are used as rugs, tent-hangings and blankets.

Among the old Turkish rugs are some wonderfully beautiful ones. It is to be regretted that to-day this district is turning out carpets of an inferior quality both in workmanship and color. From Turkey come the Ghiordes, Koulah, Bergamo, Ladic, Yuruk, Milas, Kaisarieh and Turkish Khilim rugs. Turkoman rugs come from Russian Turkestan and are known as Bokhara or Tekke, Khiva or Afghan, Yomut and Baluchistan. The Bokharan rugs are woven exclusively by women. Their design is marked by a beautiful straight-line pattern and their color is rich and harmonious.

In India the weaving is done by the men and boys, while the women are skilled in making of the dye. Tanjore is a prominent center of this industry. The large medallion-center and smaller border in green, blue, crimson and yellow are characteristic of this weave. Beautiful silk rugs come from Tanjore, Masulipatam and Benares. The modern production of Indian rugs is made under the direction of firms who control the indus-

try and sell its output in America and Europe. China also is proficient in the making of rugs, but these are much rarer than the others that have been treated. Consult Langton's *How to Know Oriental Rugs* and Mumford's *Oriental Rugs.*

Rum, a kind of spirit made by fermenting and distilling the skimmings from the sugar-pans, when sugar is made from cane-juice Enough water is added to the skimmings to produce one gallon of rum to every ten gallons of the mixture. Molasses is sometimes mixed with the skimmings, and a poorer quality of rum is made from molasses alone. The color of rum is given after distillation by adding caramel or charred sugar. Rum improves with age, and a quantity of rum, known to be 140 years old, was sold in 1865 for $15 a bottle. The best rum comes from Jamaica.

Ruma'nia or **Rouma'nia,** an independent kingdom of southeastern Europe, composed of the two former principalities of Wallachia and Moldavia. It was a part of Roman Dacia, and its people proudly claim to be Romans. It is bounded on the west and north by Austria, on the east by Russia and the Black Sea and on the south by Bulgaria, from which it is separated by the Danube. Its area is 50,720 square miles, and its population 6,865,739. The capital of Rumania is Bucharest in Wallachia (300,000), and the chief town of Moldavia is Jassy (80,000), not far from Pruth River. A remarkable feature in the agricultural system is the ownership of lands by the peasantry, which was introduced about 1864. The peasants had been robbed of their lands during long ages of feudal oppression, and at this time it was determined to restore a portion by permitting them to purchase small tracts by means of a loan from the government. The result was that in 1880 there were in Rumania nearly 500,000 holdings, averaging 10½ acres each, with the greater part of the debt discharged by the owners. In 1859 the two principalities elected Prince Couza as their ruler but in 1866 he was deposed and was succeeded by Prince Charles of Hohenzollern. In 1881 Prince Charles was invested with the kingly dignity as Carol I, with the consent of the European powers, and since that time the Rumanians have practically freed themselves from both Russian and Turkish interference and have taken their place among independent nations. He died Oct. 10, 1914, and was succeeded by his nephew Ferdinand. King Carol's widow is the well-known *Carmen Sylva* of literature.

Rume'lia or **Roume'lia** (Turkish *Rum Ili,* meaning Land of the Romans), an important portion of European Turkey, differing widely in area in different times, but most generally applied to the region between the Balkan Mountains and the Ægean Sea, corresponding to ancient Thrace and part of Macedonia.

Rum'ford, Count. See THOMPSON, SIR BENJAMIN.

Ru'minant, any cud-chewing animal. The animals belonging to this class are grass and herb-eating forms, as the cow, camel, deer, giraffe and sheep. Those living in a wild state are the favorite prey of large flesh-eating animals. In order to crop their food they must go into open, exposed places; but, as mastication is a long, tedious process, they retire to the shelter of concealed positions to ruminate or chew their food prop-

Stomach of sheep. (*a*) Œsophagus; (*c*) rumen or paunch; (*f*) abomasum or reed; (*b*) beginning of duodenum.

erly. The process of chewing the cud cannot be understood without considering the complex stomach of these animals. It consists of four compartments: the paunch, the reticulum or honeycomb bag, the manyplies and the true stomach. The food when first swallowed is in the form of a coarse pellet which pushes aside a fold in the wall of the œsophagus and goes into the paunch. There it is softened and passed into the reticulum, where it is moulded into pellets of convenient size, which are passed up the œsophagus into the mouth by a process the opposite of swallowing. Here they are carefully masticated and mixed with saliva and then swallowed again. The pellet is now smooth and fine; instead of pushing aside the fold in the wall of the œsophagus, it is guided by it into the third stomach or manyplies. This acts partly as a strainer through which the food passes into the fourth compartment or true stomach. Glands in the walls of this part secrete gastric juice and digestion is carried forward. The camels differ from other ruminants in having no third stomach.

Runeberg (*rōō'ne-ber'y'*), **Johann Ludvig,** the national poet of Finland and the greatest poet who has written in Swedish, was born at Jacobstad, Finland, Jan. 5, 1804. His beautiful epic idyl of *The Elk-Hunters* appeared in 1832, followed soon by *Christmas Eve* and *Hanna.* Others of his best works are *King Fjalar* and *Ensign Stals' Stories,* the opening poem of which, *Our Land, Our Land,* has been chosen as the national song of Finland. His poems embody the deepest feelings of the dual people of Finland, of the Finns no less than of the descendants of the Swedish immigrants. Runeberg died at Borga, May 6, 1877. See E. W. Gosse's *Northern Studies.*

Run'ner, a general name given to leafless branches sent out from the main body of the

plant, which take root and produce new plants.

Ru'pert, Prince, 1619-1682, third son of Frederick V, the Elector Palatine, and Elizabeth, daughter of James I of England. He studied at Leyden and served in the Thirty Years' War till he was taken prisoner. In 1642 he went to England in time to take part in the Civil War. For the next three years the Mad Cavalier was the life of the Royalist cause, winning battles by his resistless charges, only to lose them by too headlong pursuit. In 1645 he surrendered Bristol after a three weeks' siege. This so angered Charles that he sent him his passport to leave the kingdom. A court-martial, however, cleared him of all blame and he again became general of his uncle's forces, only to surrender to Fairfax the following June. In 1648 he became admiral of the part of the English fleet that remained true to the king. In 1651 most of his vessels were lost in a battle with Blake. Rupert escaped to the West Indies, where he led a buccaneering life. He went back to Europe, after the restoration and served with Monk against the Dutch. His last ten years he spent in study. He improved the art of mezzotint, discovered an improved gunpowder, invented the composition known as prince's metal and, perhaps, the curious glass-bubbles called Prince Rupert's drops. He was a founder of the Hudson Bay Company and of the Royal Society. See Lord Ronald Gower's *Rupert of the Rhine.*

Rupert's Land. See CANADA, HUDSON BAY COMPANY and NORTHWEST TERRITORIES.

Ru'rik, a Scandinavian adventurer, who in 862 A. D. became ruler or overlord of a part of Russia, with his court at Novgorod, sometimes styled the founder of the Russian monarchy: the Rurik dynasty gave 67 rulers to Russia and lasted 736 years (to 1598). The seventh of the line (Vladimir I, the Great) introduced Christianity; Ivan the Great unified the kingdom and first assumed the title of czar. See ROMANOFF, HOUSE OF.

Rush, Benjamin, 1745-1813, was born near Philadelphia. He graduated at Princeton in 1760, studied medicine, and became professor of chemistry in the Philadelphia Medical College. Dr. Rush was a member of the continental congress and a signer of the Declaration of Independence. He was a founder of Philadelphia Dispensary, the first in America, and of the College of Physicians, and was given several medical professorships besides the one at Philadelphia. During the yellow-fever epidemic of 1793, he was very successful in his treatment. In 1799 Rush became treasurer of the United States Mint. Among his writings, were *Medical Inquiries and Observations, Essays* and *Diseases of the Mind.*

Rural Credits. The Rural Credits Bill became a law May 4, 1916. Its purpose is to provide the farmer with capital at a low rate on long time. For that purpose it established Farm Loan Banks, capitalized by the government. A farmer desiring to obtain a mortgage invests 5% of the amount of his loan in the stock of a Farm Loan Association made up of 10 or more farmers wishing to borrow. The Associations automatically take up the stock of the banks as the number of mortgages increases. The whole system is under the control of a Farm Loan Board consisting of the Secretary of the Treasury and 4 others appointed by the president.

Rus'kin, John, born at London, Feb. 8, 1819, the only child of a wealthy wine-merchant. He took his degree at Oxford in 1842, and studied painting under Copley. The story of the earlier years of his life has been told by himself in *Præterita,* one of the most charming autobiographies in any language. In 1843 came the first volume of *Modern Painters,* which treated the principles of art in an independent and even revolutionary way. Though greatly opposed at first, Ruskin's views have largely determined the character of later English art. In 1849 appeared *The Seven Lamps of Architecture* and two years later *The Stones of Venice.* The titles of Ruskin's books often give no indication of the subject. *Notes on the Construction of Sheepfolds* deals with church-discipilne; *The Crown of Wild Olive* consists of four essays on work, traffic, war and the future of England; *Sesame and Lilies,* lectures on good literature; *The Queen of the Air,* on the Greek myths of cloud and storm; *Ethics of the Dust,* lectures on crystallization. From 1869 to 1879 Ruskin was professor of art at Oxford. Ruskin is noted for his splendid style, which for eloquence, power and richness hardly has any equal. In art he tells us that he aimed to set forth the "supremacy of five great painters, despised till he spoke of them — Turner, Tintoret, Luini, Botticelli and Carpaccio." His *Munera Pulveris* deals with political economy, on which he wrote from an independent point of view. See Cook's *Studies on Ruskin.* He died at Brantwood, in the English lake-region, Jan. 20, 1900.

JOHN RUSKIN

Rus'sell, John, Earl, English statesman, was born on Aug. 18, 1792, at London, the third son of the duke of Bedford. He studied at Edinburgh, and entered Parliament in 1813. In 1830 the Liberals came into power, and, though Russell was not a member of the cabinet, he was one of four who framed the first reform-bill. In 1835 he became home-secretary and leader of the house of commons, and introduced most of the important bills passed at this time. In 1839 he became colonial secretary. In 1846 Russell became

prime minister. Famine and rebellion in Ireland and troubles in England beset the ministry, which fell in 1852. In 1859 he became foreign secretary, an office which he held for six years. Among the features of his management of affairs were England's unfriendly tone toward the United States in the *Trent* affair, her taking part in the Mexican expedition, the interference with Russia in favor of Poland and the friendly feeling of England for Denmark during the Schleswig-Holstein War. In 1865 Lord John, now Earl Russell, became prime minister for the second time, but kept in power only for a year. He died on May 28, 1878. See Spencer Walpole's *Life of Lord John Russell.*

Russell of Killowen, Baron **Charles,** distinguished British jurist and statesman, was born at Newry, Ireland, Nov. 10, 1833, and died at London, Aug. 10, 1900. Educated at Trinity College, Dublin, he began his career as a parliamentary leader-writer, and was called to the bar in 1859. From 1880 to 1885 he represented Dundalk and from 1885 to 1894 South Hackney in the house of commons, and twice was attorney-general in Gladstone's administration. Though a Liberal and an ardent Home-Ruler, his political aspirations were subordinate to love of his profession, of which he became a great ornament. He was knighted in 1886. As a sound lawyer, acute cross-examiner and persuasive advocate, Sir Charles long was without a rival at the bar. In 1889 he increased his reputation by his masterly oration at the Parnell Commission, where he was counsel for the great Irish leader. He was one of the English counsel in the Bering Sea arbitration, and also served on the Venezuelan boundary arbitration tribunal. In 1896 he visited the United States and delivered an address on international arbitration before the American Bar Association. In 1894 he was appointed a lord-of-appeal in ordinary, with a life peerage, and later succeeded Lord Coleridge as lord chief-justice of England.

Russell, William, Lord, an English patriot, was born on Sept. 29, 1639. He studied at Cambridge and then traveled for a time on the continent. In 1669 he married Lady Rachel Wriothesley. In 1674 he spoke in the house of commons, of which he had been a silent member since the restoration, against the doings of the Cabal, the famous advisers of Charles II. From this time he was a leader of the commons. He believed in the popish plot and carried up to the house of lords the bill to shut out the duke of York from the throne. Russell, Essex and Sidney (*q. v.*) were arrested on suspicion of having taken part in the Rye House plot (*q. v.*). By means of infamous witnesses and a packed jury he was found guilty. His father's offer of $500,000 for his life was refused; he would not accept a plan made for his escape; and on July 21, 1683, he was beheaded. Pity for his judicial murder and the letters of his noble wife, who at his trial appeared at court as his secretary, have served to keep his memory fresh as a Christian hero. See the *Letters* of Lady Russell and *Life* by Lord John Russell.

Russell, William Clark, English novelist, was born at New York, Feb. 24, 1844. He is the son of Henry Russell, who composed *Cheer, Boys, Cheer; There's a Good Time Coming; A Life on the Ocean-Wave.* Young Russell went to sea at 13, and served eight years. Since that time he has been an English newspaper writer and novelist. His sea-tales rank with those of Marryat and Cooper, and are deservedly popular. Among them are *Jack's Courtship, My Shipmate Louise, The Wreck of the Grosvenor, A Sailor's Sweetheart* and *An Ocean-Tragedy.*

Russia (*rŭsh'ā*), **Empire of,** covers a large part of eastern Europe and northern and central Asia, a territory more than twice as large as Europe. Its main divisions are European Russia, with less than a fourth of the whole area but with three fourths of the population: Finland, Poland, Siberia, Caucasia, Turkestan and the Transcaspian region, besides the dependent countries of Khiva and Bokhara.

Area and Seaboard. The entire area of the empire is 8,647,657 square miles, one seventh of the land-surface of the globe. This includes (besides European Russia) Poland, Finland, the Caucasus, Transcaucasia, Turkestan, Siberia, the Transcaspian and the Amur region. The Arctic Ocean made up the whole Russian seaboard, till, at the end of the 17th century, she won the Baltic and Black Sea shores. On the north the Arctic Ocean and White, Kara, Bering and Okhotsk Seas are valuable for fishing and hunting, but these coasts are frozen a great part of the year, and Nova Zembla and the other islands are uninhabited. Vladivostok, at the head of the Gulf of Peter the Great on the Japanese Sea, is one of the finest roadsteads in the world. The chief Russian sea is the Baltic with the Gulfs of Finland, Bothnia and Riga, on which are four of the five chief seaports—Petrograd, Reval, Libau and Riga. The Sea of Azov is the great gulf of the Black Sea, whose main ports are Odessa, Batum and Taganrog. The Caspian Sea furnishes fish for all Russia; into it falls the largest river of Europe, the Volga.

Surface and Drainage. Caucasus, Finland, Poland, Siberia and Turkestan are described under these heads. A plain 700 miles wide crosses European Russia from southwest to northwest. The Urals, a series of ranges running southwest to northeast, are highest at Mt. Iremel — 4,680 feet. The Niemen, Dwina, Neva, Onega and North Dwina rivers have their sources in the broad, central plain and in general flow

northwest, while the Dnieper, Don and Volga rise in the same plain but flow southeast. The three other large rivers are the Vistula, Dniester and Pruth. The headwaters of some of these rivers have been connected by canals, as the Volga and Neva, so that now Petrograd stands not only at the mouth of the Neva but at the real mouth of the great Volga basin. The *tundras* of the Arctic shore are in the main covered with mosses and lichens. South of the *tundras* are forests of evergreens, and south of these, forests of oak, birch and hornbeam. Still further south are the Russian *steppes* or prairies.

Population. The population in 1909 was 160,095,200, distributed in the six great territorial divisions of the empire as follows: European Russia 116,505,500; Poland 11,671,800; Caucasia 11,392,400; Siberia 7,878,500; Central Asian Provinces 9,631,300; and Finland 3,015,700. Of the population it is estimated that 66 per cent. are Russian Slavs; seven per cent. Poles; five per cent. Finns; nine per cent. Turco-Tartars; three per cent. Jews. A recent partial census shows that the number of Jews in Russia exceeds 5,000,000. The chief cities are Petrograd the capital (population, with suburbs, 1,870,000), Moscow (1,468,563), Warsaw (764,054), Odessa (520,000), Kiev (320,000), Lodz, Poland (393,526) and Riga (318,400). Prior to the revolution of 1917, class distinctions between the nobility, the clergy, the merchants, the professional man and the peasants were very sharply drawn. The peasants comprised three-fourths of the population and included the former serfs. They were poor, ignorant and overworked.

Climate. The wide expanse of the empire presents great diversities of climate. North of latitude 67° is the polar region. Between that parallel and 57° the mean temperature varies from 32° to 40°, the mercury going to 30° below zero in winter. In the temperate region between 57° and 50° the mean annual temperature varies from 40° to 50°, while in the warm southern region the mercury often reaches 100° in summer, though the winter often shows extreme cold with heavy snows.

Mineral Resources. Russia is rich in minerals of all kinds. Gold is found in the Urals and Siberia; silver and lead in Siberia, the Kirghiz steppes, Caucasia and Finland; platinum in the Urals; zinc in Poland; tin in Finland; cobalt and manganese in Caucasia; while iron is abundant in most parts of the empire. Salt is got from the southern lakes; coal from Poland and about the Don River and other parts of Russia; and petroleum in Baku.

Agriculture. In European Russia, exclusive of Poland, the arable land is estimated at 401,435,000 acres; there are 474,000,000 acres of forest and 191,473,000 of grazing-land. Of the whole area 36 per cent. belongs to the state, the imperial family, towns etc.; 42 per cent. to the peasants, and 47 per cent. to private owners. In 1906 the area devoted to crops, including European Russia, Poland and Asiatic Russia, was: cereals 228,791,000 acres; potatoes 10.095,000; meadows 89,143,000. The production for the year 1910 was: wheat, European Russia, 699,413,000 bushels; Asiatic Russia 76,282,000 bushels; rye 867,622,000 bushels; barley 458,992,000 bushels; oats 1,045,991,000 bushels. Root-crops, including sugar-beets, are abundant. Cotton is raised in Turkestan and other provinces; also tobacco and silk. In 1910 the number of horses was 33,166,000, cattle 50,588,000, sheep and goats 79,166,000.

Manufactures. Russia did not become a manufacturing nation to any great extent until the serfs were freed. Her manufactures now amount to $1,460,000,000 annually. In 1911 there were 15,721 manufacturing establishments, employing 1,951,955 men and women. The chief branches of industry include textiles, sugar, leather, wood and paper.

Commerce and Transportation. Wheat and other grain-products, together with animals, head the list of exports. In 1909 the value of exports was 1,427,300,000 rubles, and of imports 909,300,000 rubles. Inland trade is much helped by the great yearly fairs at Nijni-Novgorod, Kharkoff and other cities. Trade is carried on in great part by means of the great network of rivers, besides which there are 45,078 miles of railroad. The government owns more than half of the roads. The Siberian railway (*q. v.*), completing the line from Petrograd to the Pacific coast, with its branches extends over 6,000 miles, and was built in ten years at a total cost of about four hundred million dollars. There are 55,000 miles of navigable rivers, beside 507 miles of canals and 711 miles of canalized rivers.

Education. Most of the schools are under the ministry of public instruction, though many special schools are under separate ministers. The total contribution for education in 1911 was 121,030,167 rubles, about 5,000,000 being for universities. There are universities at St. Petersburg (8,955 students), Moscow (10,087), Kharkov (4,473), Kiev (5,208), Kazan (3,049), Odessa (3,195), Yuriev or Dorpat (2,699), Tomsk (1,295), Warsaw (1,328), and Saratov (107). Total number of students, 40,396 (in 1910). According to the latest report (1911), the total number of all schools in the Russian Empire (high, middle, special and primary) was 112,549, attended by 6,234,525 pupils.

Army. With a population of nearly 95 millions of Russians and 48 millions of other races, it is possible for Russia to raise immense armies. Military service is

compulsory, service beginning at 21 and extending to the close of the 43rd year. The peace-strength of the army is 1,200,000 and the war-footing about 4,000,000.

Navy. Russia's navy was largely destroyed in the war with Japan. The present strength includes 6 battleships, with 4 building and 2 projected, 14 cruisers, 7 torpedo-gunboats, 66 destroyers and 33 building, 50 torpedo-boats and 22 submarines.

Government. Previous to the revolution of 1917 the government was nominally a constitutional monarchy, but the whole power was centered in the emperor whose will alone was law. On Aug. 6, 1905, an elective state-council (*Duma*) was created, and a law was promulgated granting to the people the firm foundations of public liberty, based on principles of the inviolability of person and freedom of conscience, speech, assembly and association, and providing that no law shall come into effect without the approval of the *Duma.* The *Duma* consisted of members elected for five years and representing the provinces and the greatest cities: Petrograd, Moscow, Warsaw, Kiev, Lodz, Odessa and Riga (law of 1907). Under a manifesto and *ukases,* published in March of 1906, the Council of the Empire consisted of an equal number of elected members and members nominated by the emperor. The Council of the Empire and the *Duma* had equal legislative powers and the same right of initiative in legislation and of addressing questions to the ministers.

The administration of the empire was still intrusted to four boards or councils. These were (1) the *Council of the Ministers,* which consisted of a president and an unlimited number of members appointed by the emperor which has advisory power in matters of legislation but no power to change laws of the realm; (2) the *Ruling Senate,* which promulgated the laws and also was the high court of justice for the empire; (3) the *Holy Synod,* to which was committed the superintendence of religious affairs; and (4) the *Committee of Ministers,* which consisted of all the ministers or heads of departments and other functionaries, and of which the privy councilor was president.

Russia was divided into governments, each ruled by a governor; Finland alone had a representative government. But in most parts of Russia there was considerable local self-government. Though Russia had trial by jury this did not apply to political cases and every year from 15,000 to 20,000 prisoners were exiled to Siberia, many without trial. The revolution began in Petrograd, March 9, 1917, with peaceful demonstrations against the corrupt management by the czar's government of the food supply of the capital. The object of this mismanagement was to play into the hands of the Germans by weakening the fighting power of the nation. Five days later the Romanoff dynasty came to an end by the abdication of the Czar. All political exiles were recalled, the Jews and other nationalities were given complete freedom and the posts of governors in the provinces were taken over by the leaders of the district assemblies.

History. The Russians are Slavs, and conquered Russia from the west, fighting eastward from the Baltic. However, the name of Russes was first given to Norse warriors who yearly passed through these Slav lands on their way to enter the Byzantine emperor's service at Constantinople. These captains seem to have been asked to protect the Slavs, and one of them, Rurik, with three of his brothers, settled there. Vladimir (980–1015) was baptized a Christian, and soon after his death Kieff, the "mother of the Russian towns," rivaled Constantinople in greatness. Under Yaroslav, who gained control of most of the Russian towns and died in 1054, the first written Russian law was compiled. During the next 200 years the Russians steadily conquered eastward. Towns and colonies were founded, which in reality were free republics, the only bonds between the different cities being those of language, race, religion and the unwritten law that the prince who was asked to defend a town should be a descendant of Yaroslav. In this period the trading cities of Novgorod, Pskov and Smolensk rose to importance. Slavery existed, though the workers of the soil were its owners, the slaves either being prisoners of war or those who remained in a servant's position for more than a year. In these years also the *boyars,* the chief warriors, began to gain power, settling the peasants on free lands and making themselves their landlords. Andrei Bogalubski (1157–74) was the prince who changed the center of gravity of Russia from Kieff to the region where Moscow was afterwards founded. He built the city of Vladimir, and plundered and burnt Kieff in 1169. Soon Nijni-Novgorod was founded as a rival of Novgorod, and this region, the home of the Great Russians, grew powerful.

In 1224 the Mongols and Tartars, who under Genghis Khan had conquered Manchuria, North China, Turkestan and Bokhara, won a decisive battle against the Russians on Kalka River. From this time Russian princes paid tribute to the khan; their courts, which now had an eastern appearance, were surrounded by Tartars and Mongols; and it was with Mongol help and armies that the rich rulers of Moscow reduced to their rule the formerly independent principalities around them. The Mongol conquest threw Russia 200 years behind the civilization of the rest of Europe, and gave Poland, Lithuania and Livonia a chance to rise into power.

It was in the 14th century under the leadership of Moscow that the Russians

first tried to throw off the Mongol yoke. Dimitri Donskoi (1359–89) fought an indecisive battle at Kulikovo, followed the next year by the Mongols for the last time storming Moscow, burning it and killing 24,000 of its people. Ivan III (1462–1505) was the first prince of Moscow to call himself Ruler of all Russia. He conquered Novgorod, and refused to pay further tribute to the khan. A Tartar-Mongol army of 150,000 men, sent to punish him, met the Russians on the Oka, and after a nine months' encampment retreated without fighting, and Russia again was free.

Ivan IV, Ivan The Cruel, was the first to take the title of tsar, and was Russia's first absolute ruler. When at three he came to the throne, the *boyars* were all-powerful, and a struggle was forced upon him, in which he was successful. Under Ivan's feeble son Feodor (1584–98) the regent Boris Godunoff forbade the peasants to leave the estates on which they worked and thus sowed the seed which grew into the serfdom that cursed the country for the next 270 years. This regent murdered Ivan's son Dimitri. On Godunoff's death a runaway monk, who lived for some time among the Cossacks ("free men"), imposed himself on Russia as the murdered Dimitri. His assassination at the end of a short reign was followed by the conquest of the czardom by Sigismund of Poland. The country was freed by a general rising, started by Minin, a Nijni-Novgorod merchant, and aided by the Cossacks. The Poles were driven out, and Mikhail Romanov (1612–45), whose grandmother was Ivan's first wife, was chosen ruler. (See ROMANOFF, HOUSE OF.)

In the reign of Alexis (1645–76) Russia, chiefly by the aid of the Cossacks, at last gained the upper hand in the long struggle with the rival Slav power of Poland. Up to the reign of Peter the Great (1689–1725) the country had in many respects been Mongol; this able ruler, who first called himself emperor and founded the new capital of St. Petersburg, made it European. He improved the army, started mining and manufactures, imported fine breeds of cattle, set up schools, and dug Russia's great system of canals. The ministers, Menschikoff under Catherine I and Dolgoruki under Peter II, were the real rulers of those reigns. The power of the German party under Anne (1730–40) and Ivan (1740–41) was lost on the accession of Elizabeth (1741–62). Peter III, who by sending his army to the support of Frederick the Great against Austria saved Prussia from dismemberment, was dethroned by Catherine II (1762–96), whose wars and the first partition of Poland widened Russia's domains in all directions. The excessive tyranny of Paul I (1796–1801) brought about his murder. In the reign of Alexander I (1801–25), the famous friend and enemy of Napoleon, took place the French invasion and the burning of Moscow. Under Nicholas I (1825–55), was fought the Crimean War. Alexander II (1855–81) freed the serfs and initiated many other reforms, which were brought to a sudden close by the insurrection of Poland (1863) and the rise of the Nihilists, who assassinated him on March 13, 1881. The reign of Alexander III (1881–94) was marked by the famine of 1890–91 and the crusade against the Jews, who were ordered to leave Moscow, Warsaw and other cities and go back to their native provinces. Nicholas II (*q. v.*), the former emperor, ascended the throne on the death of his father, Nov. 1, 1894. His reign was marked by the war with Japan, which began on Feb. 7, 1904, and closed on Aug. 29, 1905. (See JAPAN.) The result was disastrous to Russia. She lost 375,000 men in battles on land and sea, her navy was destroyed, and in settlement she surrendered to Japan her rights in Manchuria and ceded half of Sakhalin. (See RUSSO-JAPANESE WAR.) Then followed a revolt against the government, resulting in the establishment of the *Duma*. In 1917 came the revolution which deposed the czar and set up a democratic government and Russia entered upon an entirely new phase of her career. See Rambaud's *History of Russia*.

Rus'sian Hymn. Music by Alexis Lwoff (1799–1870). English version by Henry Fothergill Chorley. (1808–72). However great the merits of Lwoff as violinist, composer and writer on musical topics, his chief fame rests upon the composition of the Russian national hymn. It has been enthusiastically received and adopted by the Russian people as a noble expression of patriotic feeling, and its usefulness as a hymn for religious worship is second only to its service as a national song.

Rus'so-Jap'anese War, The, of 1904–1905 has great military interest. It not only tested the strength of two powers, with surprising results but it tested modern weapons of naval warfare in a unique way. Moreover, it marks a great era in the national life of Japan; and seems to presage general awakening of Asia. It concerned England very directly by relieving her of anxiety about India; and by the fact that she was Japan's ally, bound by a treaty of 1902 to assist Japan if a third power should interpose in the hostilities. It affected America vitally, because of the close vicinity both of Japan and Russia to the American shores.

In 1894 Japan had been robbed of the greater part of the fruits of her victory over China by the ultimatum of Germany, France and Russia, which demanded that she should withdraw from the Liaotung Peninsula. Japan submitted, but silently worked until she had prepared a first-class army and navy.

In 1902 Russia agreed to withdraw her troops by instalments from Chinese territory. She violated her agreement. In 1903 Japan made certain proposals for a good understanding with Russia. During the negotiations which followed Russia strengthened her army in Manchuria and her navy in the East. On February 6th, 1904, Japan broke off negotiations and recalled her minister from Russia.

Japan struck the first blow by a torpedo attack upon the Russian squadron which lay in the outer roadstead of Port Arthur (February 8th). This attack was followed by a bombardment at long range by the fleet of Admiral Togo on the 9th. Czar Nicholas proclaimed war on Feb. 10th.

The first Japanese army under Kuroki marched from Chemulpo, Korea, across Yalu River and won a victory over the Russian forces near Antung. Kuroki pursued the Russian troops toward Liaoyang, and meantime three other Japanese armies landed on the Liaotung peninsula under Generals Oku, Nogi and Nodzu. On May 21 Oku fought and won the battle of Nanshan Hill, cutting off Port Arthur from the Russian army under Kuropatkin at Liaoyang. The Japanese armies were then divided, Nogi with a strong force going south to invest Port Arthur, while the other divisions joined in an advance on Liaoyang. Stakelberg with a Russian force of 35,000 men was sent south to the relief of Port Arthur, but was met and defeated with heavy loss by the Japanese under Oku. Kuropatkin, with 170,000 men and 400 guns, was attacked at Liaoyang by the combined armies of Kuroki, Oku and Nodzu, numbering 200,000 men and 500 guns and under the chief command of Marshal Oyama. The battle lasted from Aug. 26 until Sept. 4 and resulted in the defeat of the Russians with a loss of more than 22,000 men. Kuropatkin halted at Sha River, and here on Oct. 9–11 he attacked the Japanese and was defeated, losing nearly 70,000 men. The active siege of Port Arthur began about August 1st, 1904, the Japanese force under Nogi numbering more than 100,000. Desperate fighting occurred from time to time until a hill was captured by the Japanese, from which they could see the town and harbor of Port Arthur. They were thus enabled to get accurate range and shell the town and harbor until the Russian warships in port were sunk and the town in large part destroyed. Port Arthur was surrendered by Stoessel on Jan. 1, 1905, with 32,000 prisoners. Nogi's army now joined Oyama's forces and the battle of Mukden was fought, beginning Feb. 24 and continuing until March 12. This proved to be one of the greatest contests in history. Marshal Oyama had nearly 450,000 men and Kuropatkin about 410,000, the total number engaged being estimated at 860,000. The battle resulted in another victory for the Japanese, the Russian loss being nearly 110,000 men, in killed, wounded and prisoners. The loss of the Japanese was estimated at 75,000 men. No serious fighting on land occurred after this battle. Meantime Russia sent a powerful fleet from the Baltic under the command of Rojestvenski. This fleet, sailing for Vladivostok, was attacked and destroyed in the Sea of Japan on May 27th, by the Japanese fleet under Togo. On the invitation of President Roosevelt of the United States, a peace conference was held at Portsmouth, N. H., opening on Aug. 9, 1905, and here a treaty of peace was signed on the 23rd of August, 1905. By this treaty Russia's lease of Liaotung Peninsula, including Port Arthur, was assigned to Japan and Russia also ceded to Japan the southern half of the island of Sakhalin.

Rust. Neither wrought iron nor steel nor cast iron can be exposed to moist air without rusting. But wrought iron, being nearly pure iron, rusts more readily than either of the others, which contain carbon. When a drop of rain falls on a clean, bright surface of iron, for a short time the drop stays clear, showing the bright surface of the iron through it. But soon a greenish appearance, which is a precipitate, is seen in the drop, and quickly becomes a reddish-brown — the peroxide of iron. This is rust. The rust does not stick to the iron but is hung in the water, and becomes a coating only when the water has evaporated. Iron remains quite free from rust in an atmosphere containing water-vapor, so long as the water-vapor does not condense as liquid water on the surface of the iron. But when rust once forms, the iron will go on rusting in an atmosphere in which a piece of clean iron will not rust, because liquid water will condense on rust when it will not on bright iron. So it is much easier to prevent the first formation of rust than to stop the process. To prevent rust, oil-paint is used, also a zinc coating (galvanizing) and japanning

Rust (in plants), a destructive disease caused by the attacks of parasitic fungi, especially injurious to wheat, oats and other cereals. Signs of the disease are spots and lines of black, yellow or brown on stem and leaf. It is one of the most formidable pests that attack grain, annually causing enormous loss. Little progress has been made in combatting it. Varieties that ripen early are less subject to attack. See ÆCIDIOMYCETES. Consult Carleton's *Lessons from the Grain-Rust Epidemic of 1904* and the U. S. Dept. of Ag. *Farmers' Bulletin 219*.

Ruth, a young Moabitess, who, after the death of her Hebrew husband, Mahlon, for the sake of her mother-in-law Naomi, came to settle in Bethlehem. There she became the wife of a near kinsman, Boaz, and the mother of Obed, grandfather of King David. The story is told in *Ruth*, and is placed

"in the days when the judges judged," about a century before the time of David.

Rut'land, Vt., is on Otter Creek, close to the Green Mountains and 67 miles southeast of Burlington. The main business is quarrying and working marble. There also are foundries and railroad-shops and it has the state workhouse, two libraries, two homes for the aged, a convent, Masonic Temple, Shriner's Home and the Howe Scale-Works. Its marble quarries are the best in the state, and yield fine white blocks equal to the statuary marble of Carrara. The town was settled in 1770, and was one of the state capitals from 1784 to 1804. It became a city in 1892. It is the second city of Vermont in population and wealth as well as the most important railroad-center. Population 13,546.

Ruwenzori (*rōō-wĕn-zō'rē*), a mountain in the center of Africa, just north of the equator, between Lakes Albert and Albert Edward. It was discovered by Stanley in 1888, and is thought to be 19,000 feet high. Its top is always covered with snow. Stanley thinks this peak and some neighboring ones — Mount Gordon Bennett and Mackinnon Peak — are the mysterious Mountains of the Moon, which geographers of the middle ages put on their maps of Africa, but which modern search has been unable to discover.

Ruysdael (*rois'dāl*), **Jakob,** the greatest Dutch painter of landscape, was born at Haarlem about 1625. He loved to paint forest-glades with oak-trees, sleeping pools beneath groups of trees, with an old picturesque building, a mill or a ruined temple or a glimpse of a distant town; a waterfall with rugged rocks; and coast-scenes where earth and water meet. He died in Haarlem's almshouse on March 14, 1682.

Ruyter (*rī'tĕr*), **Michael Adrianszoon de,** Dutch admiral, was born at Flushing, Holland, March 24, 1607, of poor parents who sent him to sea when only 11. When war broke out between Holland and England in 1652, a fleet was given to Ruyter. With it he beat off an attack by the English, and attacked Admiral Blake off the mouth of the Thames, but was forced to retire. Two months later he totally defeated Blake off Dover. When Tromp was killed off the Texel in 1653, Ruyter was made vice-admiral. For service in 1659 he was ennobled by the king of Denmark. The years 1661–3 were taken up in checking the piracy of the African states on the Mediterranean. War again broke out between Holland and England in 1664, and in 1666 Ruyter fought four days against Monk and Prince Rupert, finally driving off the British fleet, but a month later was driven back to Holland. In 1667 Ruyter threw London into turmoil by sailing up the Medway as far as Rochester, burning English ships, and entering the Thames a second time as high as Gravesend, besides attacking Harwich. In 1672 the Dutch admiral fought the French and English in Solebay, and twice defeated Prince Rupert and D'Estrées. After this defeat England made peace. In 1676 the Dutch-Spanish fleet fought the French on the east of Sicily. Ruyter was wounded, for the first time in his life of battles, and died a week later, April 29, 1676. Ruyter was a man of piety, simple in his manners and of unflinching courage. As a seaman he ranks with Nelson and Blake.

Rye, the well-known species of *Secale cereale*, a grass which probably is from western Asia. It closely resembles and is related to wheat. It is a hardy grain and is grown in cool regions. In northern Europe it is a most important crop, being used there largely in bread-making. In the United States it is used chiefly in the manufacture of malt and spirituous liquors. Russia produces the most rye, her crop in 1910 being 867,622,000 bushels, Germany coming second with 413,802,000 bushels. In the United States rye is fifth of the cereals in importance, the crop of 1910 being 33,039,000 bushels.

Rye-House Plot. In 1682-3, while a scheme was formed among the leading Whigs of England to raise the nation in arms against Charles II, another scheme was planned by a few fiercer spirits of the party to waylay and kill the king. It was to be carried out at a farm near Hertford, belonging to one of the plotters, called Rye-House. The plot failed because the house at Newmarket, where the king was staying, caught fire accidentally and caused Charles to leave sooner than intended. Both the greater and the less conspiracy were discovered before long. Though Monmouth, Russell and other Whig leaders had nothing to do with the Rye-House plot, the indignation aroused by it throughout the country took in the whole party. Russell, Sidney and Walcot, the last being of the plot, were brought to the block.

Ry'erson, Adolphus, was born in Norfolk County (Ontario) in 1803, ordained as a Methodist minister in 1825, and founded *The Christian Guardian* in 1829. This paper still is the recognized organ of the Methodist Church, and has continuously wielded great influence. Dr. Ryerson was appointed principal of Victoria College, Cobourg, in 1844 and chief superintendent for education; and examined the educational institutions of Europe in 1844-5. In 1846 and subsequent years he laid the foundations of a system of public-school education, which is the pride of Ontario. He died at Toronto on Feb. 19, 1882.

Ryswick (*rĭz'wĭk*), **Peace of,** was signed at Ryswick, a Dutch village two miles south of The Hague, by France, England, the Netherlands and Spain on September 21, 1697, and by Germany on Oct. 30. The treaty wound up the bloody contest of nearly nine years between France and the allies, which had been carried on since 1688.

1 RYE
2 OATS
3 FLAG OATS
4 DURUM WHEAT
5 BEARDED WHEAT
6 BEARDLESS WHEAT
7 BARLEY

S

S (*ĕs*), the nineteenth letter, is a consonant, often called a sibilant because the true *s* is a hissing or voiceless consonant. Its proper sound occurs in *best, hiss, so.* It also has the sounds of *z*, as in *has; sh*, as in *passion, sensual, version;* and *zh*, as in *visual.* At the beginning of words *s* generally has the hissing sound, but at the middle and end its sound is determined by custom. In a few words *s* is silent, as *aisle, débris, island, isle.* The nearness of *s* to *th* caused *th* in verbs to become *s*, as *loveth, loves.* *S* sometimes changes to *st*, as *hoist* from *hoise.*

Sab'bath (from *shabath*, to rest), the seventh day of the week, was set aside in the Hebrew Scriptures as a day of rest and devotion. It was observed by the Hebrews after the Exodus in commemoration of their deliverance from bondage (*Deut. v:15*), and perhaps preceded the Sinaitic legislation which merely confirmed its observance. The "Remember the Sabbath" of the Decalogue was followed in the giving of the laws by many regulations for the day, prohibitive of various forms of labor, and by commands to keep certain observances. The day was significant of the finishing of creation, of freedom from bondage and as a token of covenant. In the Epistles of the New Testament the keeping of the Jewish Sabbath is left optional with Christians (*Col. II:16-17*), who are exhorted to observe the first day of each week as the Lord's Day (*cf. Rev. 1:10*). The medieval schoolmen taught that the observance of the Lord's Day superseded the observance of the Sabbath by ordinance and custom of the church rather than by divine law.

Sabine (*să-bēn'*) **River, Tex.,** rises in Hunt County, in the northeast, and for part of its course forms the boundary between Louisiana and Texas. It enters Sabine Lake and thence, through Sabine Pass, the Gulf of Mexico. Its length is 500 miles; but it is only slightly navigable. Works have been carried out which have made the pass at the mouth of the river a fairly safe passage for small vessels. (See PORT ARTHUR SHIP-CANAL). The possession of this river was one of the historic boundary-questions between Spain and the United States.

Sa'bines, an old Italian people who lived first among the central Apennines, but afterwards reached down into the western plains, even to Rome itself. According to the story, a colony of Sabines occupied the Quirinal Hill in Rome, but were at last joined to the Latin followers of Romulus on the Palatine Hill, and so helped to make the Roman people. It is said that Romulus, finding it hard to get wives for his followers, who were looked down upon as runaways and criminals, invited the Sabines to a feast and games. While the games were going on, the garrison of the Palatine seized the unsuspecting women, whom they carried off to be their wives. After several wars the Sabines outside of Rome were conquered in 241 B. C.

Sa'ble. See MARTEN.

Sable Island, a low-lying island in the Atlantic, 100 miles south of Cape Breton, Nova Scotia, to which it belongs. It is made of two sand-ridges, with a lagoon between them. The island has been called the sailors' grave, from the many shipwrecks happening there. Since 1873 three lighthouses have been built, of which two have been swept away and one undermined, as the island is fast sinking. Early in the 19th century it was 40 miles long, but now it is not more than 20. Near it are sand-banks and valuable fisheries.

Sack'ett's Har'bor, N. Y., a village on a bay of Lake Ontario at the mouth of Black River, 12 miles west of Watertown. The harbor is one of the best on the lake. It is a typical military town. Madison Barracks, regimental headquarters, are here. In the War of 1812 Sackett's Harbor was the headquarters of the northern division of the American fleet, and several war-vessels were built here. It was twice attacked by the British, who were driven off. Sackett's Harbor is becoming a popular summer-resort. Population (1910) 868; excluding the civilians living on the military reservation.

Sacramento, Cal. (*săk-rà-měn'tō*), capital of California, is on the east bank of Sacramento River at the mouth of the American, 90 miles by rail northeast of San Francisco. The main public buildings are the capitol; the courthouse, hospital, postoffice, a Roman Catholic Cathedral, Crocker Art-Gallery, and the Masonic and Odd Fellows' Halls. There are flour and planing mills, carriage, harness and broom factories, potteries, automobile, rivet and pipe works and a cannery. Here also are the shops of the Southern Pacific Railroad, employing 3,000,

and also the Western Pacific shops. Sacramento was settled in 1839 by a Swiss, who built a fort in 1841. It was not till 1848, after the discovery of gold, that the city, at first a town of tents, was laid out. It became the capital in 1854. Population 76,662.

Sacramento, the largest river of California, rises in the northeastern part of the state, and flows southwest through the Sierra Nevada to Shasta, south to Sacramento and thence southwest into Suisun Bay, through which its waters pass into San Pablo Bay and to the Pacific. It is about 500 miles long, and is navigable for small boats to Red Bluff, nearly 250 miles. Its chief branch is the San Joaquin.

Sacs and Foxes, Indian tribes which settled near Green Bay, Wis. They lived and usually acted together. Both belong to the Algonquin family. Among the Sacs the children of each family at birth are marked white or black in turn, thus dividing the tribe into two bands, the white or Kiscoquah and the black or Oshkosh. The Foxes also were in two branches, the Outagamies (foxes) and the Musquakink (men of red clay). Both tribes were daring and warlike, fighting courageously the much more numerous Iroquois and Sioux. The French had no greater enemies and the English no greater friends than the Foxes, who attacked Detroit in 1812, and were cut to pieces at Presque Isle on Lake St. Clair, to which they had retreated. The Sacs on the whole favored the English, serving under Pontiac, supporting the British in the Revolutionary War and fighting under their renowned chief, Blackhawk, in 1832 to recover their hunting grounds from the United States. In 1857 a party of 317 Sacs and Foxes bought lands at Tama, Ia., which they have worked, becoming industrious and self-supporting. The two tribes now number about 1,000, separate bands living in Iowa, Nebraska, Kansas and Oklahoma.

Sadi (*să'dē*), the assumed name of Sheikh Muslih Ad-din, one of the most celebrated of Persian poets, who was born at Shiraz about 1184. Little is known of his life. His father's name was Abdallah, and he was a descendant of Ali, Mohammed's son-in-law. He studied science and theology at Bagdad. He traveled for many years in parts of Asia, Africa and Europe The catalogue of his works contains 22 different kinds of writing in prose and poetry, in Arabic and Persian. The greater part are odes and dirges. The finest of his works is *Gulistan* or The Flower-Garden — a kind of moral work in prose and verse, made up of eight chapters on such subjects as kings, old age and education, with stories, puns and maxims. Two others of his works are *Bustan* or The Tree-garden and *Pand-Namah* or The Book of Instructions. See Robinson's *Persian Poetry for English Readers* and Sir Edwin Arnold's *With Sadi in the Garden.*

Sadowa (*să-dō'vă*), a Bohemian village 58 miles northeast of Prague, where an important victory was gained by 240,000 Prussians under King William I over 220,000 Austrians under General Benedik, July 3, 1866. The battle lasted from 8 A. M to 4 P. M., and resulted in the rout of the Austrians, who lost 21,000 men and 22,000 prisoners. The Prussian loss was 9,000 men. This battle, which is often called Königgratz from a town eight miles distant, decided the Austro-German or Seven Weeks' War of 1866.

Safe'ty-Lamp. When marsh-gas, which is often set free in large quantities from coal-seams, is mixed with ten times its volume of air, it becomes highly explosive. Moreover, this gas, the fire-damp of mines, in exploding, renders ten times its bulk of air unfit for breathing, and the choke-damp thus produced is often as fatal to miners as the first explosion. To do away with these dangers, Sir Humphry Davy began his experiments on flame, which resulted in his invention of the safety-lamp. He found that when two vessels filled with a gaseous explosive mixture are joined by a narrow tube and the contents of one fired, the flame does not reach the other, provided the thickness of the tube, its length and the conducting power for heat of its material bear certain proportions to each other; the flame being put out by cooling and its transmission made impossible. He found also that high conducting power and less thickness make up for less length; and to such an extent may this shortening of length be carried that metallic gauze, which may be looked upon as a series of very short, square tubes arranged side by side, wholly stops the passage of flame in explosive mixtures. His lamp consists of a burner inclosed in a wire-gauze. When such a lighted lamp is brought into an explosive mixture of air and fire-damp, the flame is seen slowly to enlarge as the amount of fire-damp increases, until it fills the entire gauze-cylinder. Whenever this pale, enlarged flame is seen, the miners should at once get to a place of safety; for although no explosion can take place while the gauze is sound, yet at that high temperature the metal becomes rapidly burnt and might easily break, and a single opening, if large enough, would then cause a destructive explosion. Many improvements have since been made in Davy's lamp.

Safe'ty-Valve, an appliance for obviating or diminishing the risk of explosion or collapse in steam-boilers, by allowing steam to escape or air to enter. The forms of safety-valves are various but the principle of all is the same, — that of opposing the pressure within the boiler by such a force

as will permit the escape of steam before the pressure reaches a point of danger. The airtight valve is usually kept in its place by weights above on a lever or by a spring. United States regulation requires that leyer safety-valves shall have an area of not less than one square inch to every two square feet of grate-surface in the boiler. This insures not overweighting the valve. The simplest form is a weight on a steamtight plate fitted over an aperture in the boiler.

Saf'fron is got from the dried flowers of the saffron crocus. It is used as a coloring matter for some articles of food and medicines. It was formerly used for dyeing cloth yellow. Saffron was of much greater importance centuries ago than it is now. The early Greeks used it as a dye, and both they and the Romans as a perfume. As late as the 15th century persons were burned alive in Nuremberg for adulterating saffron. The plant is raised in Persia, Afghanistan, Kashmir, southern Europe and England.

Sage, a general name for a species of *Salvia,* a genus of the mint family, containing about 500 species and distributed throughout the temperate and tropical regions. Over 30 species are found in North America. The common garden-sage is *S. officinalis* from southern Europe. The showy, red-flowered species, which are common in gardens and parks, are derived from several species, prominent among which are *S. splendens* of Brazil and *S. fulgens* of Mexico.

Sage-Cock, Sage-Grouse or **Cock of the Plains,** the largest grouse found in North America. After the turkey it is the largest game-bird in the United States. It lives on the western plains in the Rocky-Mountain region and feeds on wild sage, from which circumstance its name is derived. It feeds also on grasshoppers, crickets, berries, grain and grass-seeds. A full-grown male reaches a weight of six pounds. The upper parts are brown, varied with gray, black and buff, and the under parts mostly black. The bird has a long pointed tail composed of 20 stiff feathers. It also has large air-sacs of yellow skin on each side of the neck. These are inflated in the spring and enable it to produce a deep hollow tone, a booming sound resembling that made by blowing into a large, hollow reed. The nest is made on the ground, concealed under low bush or herbage, is built of small twigs and dried grasses. The eggs generally number from 13 to 17, are brown in color and blotched at one end. In winter the birds dwell together in large flocks; in summer and autumn they are found in smaller companies. The flesh is eaten, but often has a bitter taste.

SAGE-COCK

Sage, Russell, American capitalist and financier, was born in Oneida County, N. Y., Aug. 4, 1816; was brought up on a farm; and received his education at the public schools. In early life he engaged in mercantile pursuits at Troy, N. Y., and was elected to Congress as a Whig in 1853, serving for four years. In 1863 he removed to New York City, where he became interested in railways, especially in the New York elevated-railroad system, as also in various telegraph and cable companies. Becoming a large operator in railway and other stocks, and from buying and selling "privileges" in Wall Street, he amassed great wealth and became director in numberless New York corporations. He died on July 22, 1906, leaving his estate to his wife, who has administered it with wise beneficence in the interests of philanthropy.

Saghalien' or **Sakhalin** (*sȧ kȧ-lyĕn'*) is a long but somewhat narrow island off the Siberian coast, to the north of Japan. The island has an area of some 29,000 square miles. The interior is mountainous, unfitted for cultivation and covered with pines and firs. The mountains rise in three parallel ranges, and reach a height of about 5,000 feet. The principal industries are fishing, hunting, lumbering and coalmining. At one time Saghalien belonged to the Chinese Empire; but its southern portion was occupied by the Japanese early in the nineteenth century and bartered to Russia in 1875 in exchange for some small islands of the Kurile group south of Japan. The longest river, the Tym, has a course of about 150 miles. Alexandrovsk is the chief town of Saghalien. The total population is about 40,000. By treaty at the close of the Russo-Japanese War in 1905 the southern half of the island was ceded to Japan.

Saginaw (*sȧg'ĭ-nȧ*), **Mich.,** its third city, stands on both sides of Saginaw River, 108 miles northwest of Detroit. The city is the headquarters of the Saginaw Bay lumber and salt trade, and its flour-mills, furniture and other factories stretch three miles along the river. In recent years the mining of soft coal and manufacture of beet-sugar have become leading industries. It is a busy, growing place, and until recently was separated into the cities of Saginaw and East Saginaw. Saginaw was founded in 1822. Population 50,510.

Saginaw Bay, an arm of Lake Huron and the largest inlet of the southern penin-

sula of Michigan, is 60 miles long and 30 wide. Saginaw River, 30 miles long, falls into it. It has several good harbors, and under its islands and shores vessels find shelter from the fierce storms that sweep over Lake Huron.

Sa'go, a starch obtained from the stems of certain palms. See PALM.

Saguenay (*săg'e-nā'*), a large river of Canada, falling into the St. Lawrence, about 115 miles below Quebec. It drains Lake St. John, and is about 100 miles long. In its lower course it flows between cliffs, often from 500 to 1,500 feet high, and in many places is two or three miles broad. Its scenery is beautiful, and it is navigable for the largest steamers to Ha Ha Bay. At its mouth is the watering-place and former fur-post of Tadousac.

Sagun'tum, a wealthy and warlike town of early Spain, stood where the modern town of Murviedro is now, near the mouth of Pallantias River. It was a Greek trading-town of prominence, but is kept in memory because of its siege and destruction by the Carthaginians under Hannibal in 219 B. C. Having held out the greater part of a year against the great captain and his army of 150,000, the half-starved Saguntines preferred death to unavoidable surrender. Heaping their valuables into one huge pile and placing their women and children around it, the men made a last sally and the women fired the pile, casting themselves upon it with their children, thus expiring in the flames at the same time that their husbands were dying in battle. The capture of Saguntum initiated the second Punic war. See CARTHAGE, HANNIBAL and ROMAN EMPIRE.

Sahara (*sȧ-hȧ'rȧ*), the vast desert region of North Africa, stretching from the Atlantic to the Nile and from Morocco, Algeria, Tunis and Tripoli south to the Sudan, is estimated to have a total area of 3,459,500 square miles. Europe could almost be put into this space. It is a link in the chain of great deserts which girdle the Old World from the Atlantic across Africa, Arabia, Persia, Turkestan and Mongolia to the Pacific. The old idea that the Sahara was a vast expanse of sand and once the bed of an inland sea is hardly true. The surface is mostly above the sea, and in one place reaches a height of 8,000 feet. Of large tracts next to nothing is known. On the northern side of this desert is a vast bow of sand-hills; the middle portion is a high tableland with snow-clad mountain peaks; and in the east and west are mountain ranges. Water can almost always be found in the hollows between the sand-dunes and also a little below the surface in the deep valleys between the western mountains, these valleys being mostly dry beds of old rivers. In many parts of the Sahara are oases, islands of green in the midst of an ocean of desert. These oases are most plentiful on the southern side of the Atlas and Algerian mountains, on the northern side of the large central tableland and along certain lines across the desert, which mark the caravan routes between the Sudanese states and the Mediterranean. The principal routes lead from Timbuktu to Morocco and Algeria; from Haussaland and Bornu in Nigeria to Tripoli; from Wadai to Barca; and from Darfur to Siut in Egypt.

A large part of the Sahara, though not the whole, undoubtedly was under water once. The greater part of the surface seems to have been raised, and a process of drying up, similar to that which is now going on in the Turkestan desert, has gone on here from the earliest historic times. The sand is the Saharan rocks ground to dust. The great heat by day causes the rocks to expand; the great fall of the temperature by night, with the great evaporation which then takes place, makes them split and crack and break in pieces; and the strong, fierce winds use these pieces like files or sand-blasts to grind other rocks to fragments. These sand-storms are more feared by the traveler than lack of water. Thick deposits of sand have been found on the floor of the Atlantic, a long way west of the African coast. The thermometer falls from above 100° F. during the day to just below freezing-point at night.

On the oases grow date-palms, oranges, peaches and other fruits, rice, millet etc. The oases are the chief centers of population. In the desert little grows except thorny shrubs and coarse grasses. The giraffe, antelope, wild cattle, the wild ass, jackal, ostrich, crow, viper, python, locusts and flies are found. The camel is the great carrier. The people, numbering 2,000,000, are Moors, Berbers, Negroes, Arabs and Jews. The chief products are dates and salt. But a large trade is carried on by caravans, bringing to the Mediterranean ivory, ostrich feathers, gums, hides, gold-dust etc. To get this trade the French are building a railroad from Algiers, which is to extend across the Sahara to the Niger. Another road is projected from Tripoli to the Sudan. Many thousand tons of phosphate are extracted. Different plans for flooding the Sahara and so making it an inland sea have been proposed, but have been dropped since it became known that the greater part is above sea-level. However, the French since 1856 have dug many artesian wells, striking water in abundance at depths of 10 to 300 feet. Wherever these wells have been bored, date-palm groves and orchards have increased in size and the population has become greater.

The Sahara, to the extent of a million and a half square miles, has been recognized by Great Britain as under the protectorate of France, taking in the entire

desert from the Nile basin to the undefined Spanish boundary on the west. It has not yet been brought under French administrative schemes. See Barth's *Travels in North and Central Africa.*

Saigon (*sī-gŏn'*), capital of French Cochin-China, stands on Saigon River, 60 miles from the sea. The present town has grown up since 1861, and is one of the handsomest cities of the east. The governor's palace, cathedral and arsenal are among its fine buildings. Chinese, Anamese and French make up the bulk of the population of 50,870, the suburb of Cholon, really a part of the city, having 130,000 inhabitants. Saigon is the chief port between Singapore and Hong-Kong. There is a railroad from Saigon to Mytho. The main export is rice. See COCHIN-CHINA.

Sail. Sails are generally made of flax and hemp, but jute, cotton and linen are also used, while savages make them of matting and vegetable fibers. Sails are stretched by means of masts, yards, booms, gaffs and ropes. A vessel of shallow draught or of narrow beam can bear little sail, while a vessel of deep draught and heavily ballasted, as a yacht, or a vessel of great breadth of beam can carry large sail. A sail acts with greatest power when the wind is right astern, but it can be applied with less strength when on either beam. In the latter case the force of the wind is divided into two parts, one part tending to make the ship go forward, the other tending to make it go sideways, but from the shape of the vessel this second force causes little motion; any that it does cause is called leeway. The sails which are set square across the ship are nearly square in shape, and are called square sails. But many which are set parallel with the keel, called fore-and-aft sails, are also four-sided. Others are three-sided, as stay-sails, which are suspended from the ropes which stay the masts. The larger sailing-vessels usually carry both fore-and-aft and square sails. The schooner has mainly fore-and-aft sails. The brig is mainly square-rigged, and the brigantine is a cross between the brig and the schooner. The cutter is a fore-and-aft one-master. The ordinary sails are mentioned under YACHT.

St. Albans (*al'banz*), a town of Hertfordshire, England, famous for its Benedictine abbey, which was founded by Offa, king of Mercia, in 793. Cardinal Wolsey was its greatest abbot. It contains the tomb of Sir John Mandeville, the early traveler. In St. Michael's church is Lord Bacon's monument. Here were fought two battles during the War of the Roses. Population 16,109.

St. An'drews, a Scottish town, stands on St. Andrew's Bay, 42 miles northeast of Edinburgh. St. Rule's tower; the bishop's castle, noted for its battle-dungeon and within whose walls Cardinal Beaton was slain; and the cathedral consecrated in the presence of Robert Bruce are among the interesting buildings. The schools of St. Andrews were well-known in 1120, but the university, the first in Scotland, was not founded till 1411. It is one of the smaller British universities, but is doing much for the higher education of women. The library has over 100,000 volumes, and there is a good museum. Population 7,621.

St. Augustine (*a'gŭs-tēn'*), **Fla.,** an old Spanish town on the eastern coast, stands on Matanzas Sound, two miles from the Atlantic and 37 southeast of Jacksonville. It was founded by Menendez, who built a fort here in 1565, and is the oldest town in the United States. It was several times attacked by the French, English and Indians. A sea-wall, a mile long, affords a fine promenade. The postoffice once was the residence of the Spanish governor, and the large barracks occupy an old Franciscan monastery. The old fortress of San Marco, now Fort Marion, was built by Indian slaves, who worked on it for more than a century. Besides its quaint Spanish lanes and balconied buildings, crumbling gates and magnolias, palms and oleanders, it has the most costly and magnificent hotels in the world. Two of these, the Ponce de Leon and the Alcazar, are massively built of shell-concrete, with towers, casinos and courtyards; a third is Hotel Cordova. Attractive drives, yachting and, above all, the climate bring thousands of northern visitors. Population, 5,494.

St. Ber'nard Dog. See DOG.

St. Bernard (*sānt bĕr'nārd*), the name of two passes in the Alps. Great St. Bernard is 8,120 feet high. Almost on its crest stands the celebrated hospice founded in 962 by Bernard de Menthon, a neighboring nobleman, for the benefit of pilgrims journeying to Rome. It is the loftiest inhabited place in Europe. Now a telephone tells the monks when travelers are on their way up the mountain. These dozen monks, all young and strong, with the aid of large dogs—no longer the famous St. Bernard dogs, but Newfoundlands — rescue travelers who are in danger of perishing from the snow and cold. There is a botanical garden for Alpine plants on the northern slope of the pass. It was over this pass that Napoleon marched his army. Little St. Bernard is the pass used by Hannibal when he led his troops into Italy. It also has a hospice, 7,143 feet high.

St. Cath'erines, Can., on Welland Canal which connects Lake Erie and Lake Ontario. It is on the main line of the Grand Trunk Railway from Toronto to Niagara Falls. It takes water-power from the canal and has many and varied important industries. It is the center of a very rich fruit-country. It has railway communication from Port Dalhousie on Lake Ontario, which is only six miles distant. Comfortable passenger-

boats cross the lake a distance of 34 miles to Toronto. It has electric railway communication with Buffalo.

Saint Charles, Mo. County-seat of Saint Charles County, located on the Missouri River, twenty miles from Saint Louis, with which it is connected by railroads and electric lines. It is the center of a rich agricultural section and has one of the most extensive car-factories in the United States. Other manufactures are shoes, oil engines, flour, furniture, brick, cob-pipes and beer; corn, wheat, tobacco and limestones are marketed there. It is the seat of Lindenwood Female College, Saint Charles Military College and The Sacred Heart Academy. Population, 10,056.

St. Clair', a river of North America, in the line of the Great Lakes, carrying the waters of Lake Huron into Lake St. Clair at the rate of 225,000 cubic feet a second. It is over 40 miles long and half a mile broad. In 1891 a railroad tunnel under its bed was finished between Port Huron, Mich., and Sarnia, Ont., including approaches 11,553 feet long.

Lake St. Clair is 26 miles long and 25 wide. From its southwestern end the volume of water it has received passes into Lake Erie by means of Detroit River.

St. Cloud (*sānt'-klōōd*), a French town near the Seine, ten miles west of Paris. St. Cloud was long famous for its fine castle, built by the Duke of Orleans, the brother of Louis XIV. It afterwards was a favorite palace of Napoleon. It was destroyed during the siege of Paris in 1870. Population 7,195.

St. Cloud', Minn., city and county-seat of Stearns County, on the Mississippi River, about 65 miles northwest from Minneapolis. In the vicinity are extensive granite-quarries, and the surrounding country is agricultural. The chief manufacturing establishments are flour-mills, woodworking factories, machine-shops and foundries; there also are grain-elevators and stock-yards. St. Cloud has good public and parochial schools, a state normal school and Saint Clotilde Academy of Music. Here, too, are Minnesota Reformatory, Saint Raphael Hospital and Saint Joseph Home for the Aged. The settlement was established in 1852, incorporated in 1856, and became a city in 1868. It has the service of the Northern Pacific and Great Northern railways. Population, 14,000.

St. Croix (*kroi*), called also the Passamaquoddy and the Schoodic, a river flowing out of Grand Lake on the eastern border of Maine, runs southeast 75 miles to Passamaquoddy Bay. It forms part of the boundary between the United States and New Brunswick. It is navigable to St. Stephen, twenty miles from its mouth.

St. Cyr (*sānt'sēr'*), a French town two miles west of Versailles. A school for poor girls was founded here by Louis XIV, and for its pupils Racine wrote his tragedies of *Esther* and *Athalie*. In 1806 Napoleon founded in its place the military school of St. Cyr, one of the most famous in the world. Population 4,250.

St. Denis (*sānt de-nē'*), a noted French city, is four miles north of Paris, within the line of forts forming the outer defenses of the capital, and was itself formerly fortified. A famous fair has been held here since 1552. The Abbey of St. Denis was the burying-place of the kings of France. The finest of the tombs are those of Louis XII and Anne of Brittany, his queen, Francis I, Henry II and Catherine de Medici. Napoleon turned the abbey into a school for the daughters of offices of the Legion of Honor. During the French Revolution the tombs were demolished and the bodies cast into ditches. Population 60,808.

St. Eli'as, Mount, a great volcanic mountain in Alaska, near the Canadian boundary line. It was long thought to be the highest mountain on the American continent, but is now known to be surpassed by Mt. Logan, 26 miles northeast of St. Elias and by Mt. McKinley in Alaska. Its height as determined by the United States geodetic survey is 18,100 feet. It is covered almost from base to top with never-melting snow. There are huge glaciers, precipices and chasms, which make the peak hard to climb. It was ascended in 1897 by Prince Louis Amadeus of Savoy.

St. Étienne (*sānt'tā'tyĕn'*), a large manufacturing city of France, stands on a branch of the Loire, 36 miles southwest of Lyons. It is in the midst of the second-largest coal-field in France, from which are taken 3,000,000 tons of coal a year. The art-gallery, school of mines and museum are the chief institutions. There is a large national gun-factory, which since the Revolution has furnished nearly all the muskets, rifles and revolvers for the army. Steel and iron plates, guns, armor, iron masts, machinery-castings, locks, cutlery, ribbons and laces are the chief manufactures. The coal-mines have been worked since the 14th century. The first two French railroads were built from St. Étienne. The town was captured twice by the Huguenots, and has suffered three terrible plagues. Population 148,566.

Saint Gaudens (*gā'denz*), **Augustus,** American sculptor, was born at Dublin, Ireland, March 1, 1848, and came in his infancy to New York. Here he learned the trade of a cameo-cutter, and studied drawing at Cooper Institute and later at the National Academy of Design. From 1867 to 1872 he pursued his artistic studies at the *École des Beaux Arts*, at Paris, and

SAINT GAUDENS

at Rome, where he produced *Hiawatha*, his first sculptured figure. Returning to New York, he opened a studio and produced a number of busts, statues and emblematic subjects. The more prominent of these are his statues of Abraham Lincoln, Admiral Farragut, William M. Evarts, Gen. W. T. Sherman, John A. Logan, Peter Cooper, Robert R. Randall, Theodore D. Woolsey, and other memorial sculptures, portrait-busts, bas-reliefs, tablets etc. Notable, also, are his figure pieces — *The Puritan*, *Diana* (on the tower of Madison Square Garden in New York City) and the fine bas-relief in St. Thomas Church, New York City, entitled *Adoration of the Cross by Angels*, unhappily destroyed by fire in 1905. Effective also is his *Shaw Memorial* tablet in Boston Common. He was the recipient of many medals and honors; while France made him an officer of the Legion of Honor and corresponding member of the Institute of France. He died at Cornish, N. H., Aug. 3, 1907.

St. Germain-en-Laye, (*zhân'măn'*) a famous French city on the Seine, 13 miles east of Paris. A fine terrace, built in 1672, runs along the river in front, and behind the city is a royal forest of 10,000 acres. The royal castle was the favorite residence of the kings of France until Louis XIV moved the court to Versailles. Population 17,297.

St. Gotthard (*sânt'gŏth'ärd*), a mountain in the Alps, 9,850 feet high. Here are the sources of the Rhine, Rhône, Ticino and Reuss, whereby St. Gotthard sends its melted snows to the German Ocean, the Mediterranean and the Adriatic. Across its shoulder runs one of the famous passes from Switzerland to Italy, 6,936 feet high. Near the top stand two hotels and a hospice for the 12,000 travelers who use the pass every year. Now most of the traffic goes through the tunnel, finished in 1880, which is 9¼ miles long and cost $11,350,000, while the whole cost of the St. Gotthard railroad was $45,400,000.

St. Helena (*hĕ-lē'nȧ*), a lonely island in the Atlantic, 1,200 miles from the western coast of Africa, covering 47 square miles. It is a part of an old volcano; and High Hill is 2,823 feet above the sea. Its shores are cliffs from 600 to 2,000 feet high, cut by deep, narrow valleys. The people, who number only 3,512, raise potatoes, and fish for whales. Jamestown is the sole town. The Suez Canal destroyed a large trade with vessels which stopped on the way to and from India by the Cape of Good Hope. The chief trade now is the export of the produce of the whale-fisheries to the United States. There are cable-communications with Cape Town and with São Vicente in the Cape Verd Islands. The island is a British coaling-station, and the naval squadron of the Cape and West Africa rendezvous there frequently. St. Helena was discovered by the Portuguese in 1502, and taken possession of by the British East India company in 1651. The island is chiefly noted as the place of Napoleon's imprisonment from 1815 to his death in 1821. His home was the farmhouse of Longwood, three miles inland from Jamestown. Many Boer prisoners were sent here during the war in South Africa. See Melliss' *St. Helena*.

St. Hen'ri, Can., suburb of Montreal and also in Hochelaga County, has 21,192 inhabitants. It is two miles from the metropolis, Ste. Cunégonde lying between.

Saint-Hilaire (*săn tē'lĕr'*), **Geoffroy Étienne,** a French naturalist, noted for his work in comparative anatomy and for his connection with the theory of evolution. He was born at Étampes, April 15, 1772, and died at Paris in 1844. He became attached to the Museum of Natural History at the *Jardin des Plantes*. Here he was associated with Cuvier and Lamarck. He became professor of zoology, and devoted himself mainly to the study of vertebrates. He published works on the structure of animals and on the philosophy of anatomy. In 1803 he was given the badge of the Legion of Honor, and in 1807 was elected to the Institute. He reached the conclusion that there is a unity of plan in the construction of all animals, and he accounted for the origin of different animals through the changes produced in them by the surrounding conditions. As an evolutionist he sided with Lamarck against Cuvier, who believed in the fixity of species. (See EVOLUTION.) He, however, was more nearly a follower of Buffon than of Lamarck. In 1830, just after the death of Lamarck, he engaged in a controversy with Cuvier before the Institute on the unity of type and the evolution of animal life. This debate was so famous that it stirred all intellectual Europe Cuvier won by his great authority and the more skillful management of his side of the case. He was partly right but as regards the evolution of animal life later evidence is against him.

St. Hyacinthe (*hī'ȧ sĭnth*), **Can.,** county-seat of the county of that name, lies on the west bank of Yamaska River, 35½ miles from Montreal on the Grand Trunk Railway. It has 9,210 inhabitants, and is the seat of a Roman Catholic cathedral and a large Dominican college. Much manufacturing is done, chiefly shoes, woolen-goods and milling-machinery.

St. James' Palace, a large brick building, fronting toward Pall Mall, London. At first a hospital, it was made a royal manor by Henry VIII. Here Queen Mary died, and Charles I slept here the night before his execution. When Whitehall was burned in 1697, St. James became the regular London palace of the English sovereigns and so continued until Queen Victoria removed the royal household to Buckingham Palace in 1837. The Court of St. James is a name often given to the British court.

St. John, City of, Can., is the great seaport of New Brunswick. Its harbor is open all year and with Halifax disputes the position of the first winter-port of Canada. This excellent harbor has large wharves and an elevator. It is the terminus of the Canadian Pacific Railway (*q. v.*), and is tapped by a branch of the Inter-colonial. A branch of the Grand Trunk Pacific (*q. v.*) will reach it. Ocean-liners run to this port particularly in winter, and it has constant steamship-connection with the New England cities and Nova Scotia. One of its attractions is the natural wonder of the reversible falls in St. John River. When the tide is out, the falls flow towards the sea, but, as the tide rises, it gradually obliterates the cataract until there is still water over its side through which vessels may pass, and then it rises until the falls are flowing inward up the river. Population 42,000.

St. John Lake, Can., known to all travelers which measures 26 miles in length by 24 in breadth, and drains an immense valley that bears its name. It also receives several large rivers which drain lands of great fertility. The chief rivers to the south are the Metabethchouan and the Ouiatchouan; to the east, La Belle Riviere; to the west, the Ashuapmouchouan; to the northwest the Ticouapee and Mistassini; to the north and northeast, the Great and Little Perihonka The depth of water generally is three feet a mile from the shore, from 12 to 54 feet a couple of miles further out, and about 60 to 80 feet at the center. It is in this fine lake and its numerous tributaries that sportsmen enjoy magnificent fishing for the ouananiche or freshwater salmon. Several steamboats navigate the lake, all starting from Roberval.

St. John of Jerus'alem, Knights of, a celebrated military and religious order of the middle ages, was founded about 1048 in a hospital built by merchants of Amalfi at Jerusalem for the care of pilgrims to the Holy Sepulchre. After the conquest of Jerusalem by the crusaders in 1099, the hospital servants were joined by many from the Christian army, who resolved to devote themselves to the service of poor and sick pilgrims. They soon became an order, which was military as well as religious, and the members of the order became known as Hospitallers. Saladin forced them in 1191 to retire to Acre, the last Christian stronghold in Palestine, which they held with great bravery for a century, but then after a terrible siege were compelled to sail to Cyprus. In 1310 the knights captured Rhodes and seven neighboring islands from the Greek and Moslem pirates, and for over 200 years waged successful war against the Turks. In 1523 Sultan Solyman captured Rhodes, and after a short stay at Crete Charles V gave Malta, with Tripoli and Gozo, to the Hospitallers. In 1565 Dragut, the corsair, after capturing Tripoli, laid siege to Malta, but was beaten off. By 1798 the order was of little importance, and Malta was surrendered to the French. Certain branches are still kept up in Europe.

St. John, a river rising in Maine and flowing into the Bay of Fundy. It is navigable for small craft for 155 miles to Woodstock. Through most of its upper course it forms the boundary line between Maine and Canada.

St. John's, capital of Newfoundland, is on the eastern coast, 1,076 miles northeast of Montreal, and is the nearest port in America to Europe, being only 1,730 miles from Cork. It has a good harbor, two railroads and a number of manufactures. Population 29,594.

St, Johnsbury, Vt., at the junction of three railroads, is the home of E. & T. Fairbanks & Co., scale manufacturers. Machine shops, granite shops, builders' finishing, grain, grocery, maple sugar, fork and hoe factories are located here. St. Johnsbury has an academy with over 300 scholars, a library, and a museum of natural science. Population, 9,000.

St. Jo'seph, Mo., on the Missouri, is served by eight railroads and several interurbans. The river is crossed by a steel railroad bridge of five spans, one a draw-span of 365 feet. The State Hospital for the Insane, St. Joseph's Hospital, Ensworth Hospital, Noyes Hospital, 3 public libraries and 37 public schools with 375 teachers are located here; also a dozen private schools and colleges. There are 73 jobbing-houses and extensive manufactures of men's working clothes, boots, shoes, harness, saddlery, office-fixtures, confectionery, stationery, millinery and groceries. The stockyards cover more than five hundred acres, and the annual livestock receipt averages 3,200,000 head, which places St. Joseph in a prominent position among the large packing house centers of the west. It is also an important grain market. The output of flour mills, creameries and tanneries is very large. Joseph Robidoux, a French-Indian trader, laid out the town in 1843. It soon became famous as a starting-point for the long journeys in wagons across the plains, and was the eastern terminus for the Pony-Express. Its area is 8,742 acres. Population, 85,000.

Saint-Just (*săn'zhŭst'*), **Louis Antoine de,** French revolutionist, was born at Décize, Aug. 25, 1767. While studying law at Rheims he was captivated by Rousseau's writings, and, to become a writer, set off to Paris at 19, taking some of his mother's plate, and was at her request imprisoned for six months. His essay on *The Spirit of the Revolution* gained him some standing, and as a member of the convention he attracted notice by his fierce tirades against the king and by making the opening speech on the verdict at

his trial. As a follower of Robespierre he began the attacks on Hébert, which sent him to his doom, quickly followed by the fall of Danton. Saint-Just fell with Robespierre, but unlike him, carried his head high on the tumbrel, and died without a word, July 28, 1794.

St. Law'rence, Gulf of, washes Newfoundland, Quebec, New Brunswick and Nova Scotia. It is joined to the Atlantic by the Strait of Belle Isle between Newfoundland and Labrador; by the Gulf of Canso between Cape Breton and Nova Scotia; and by a wider passage than either between Cape Breton and Newfoundland. The main islands are Anticosti, St. Paul's and Prince Edward. The gulf is noted for its fisheries.

St. Lawrence River, The, 750 miles long, is one of the most picturesque and interesting rivers in the world. It flows from Lake Ontario into the Gulf of St. Lawrence. The waters of the great inland lakes find in it their outlet. Shortly after leaving Lake Ontario, it expands into the Lake of The Thousand Islands, world-famed for their beauty. Leaving the islands and reaching nearly to Montreal are a series of rapids, the Galops the Long Sault, the Coteau, the Cedars, the Cascades and Lachine. To eastbound passengers they are exciting and interesting. The return trip is made by means of canals built at great cost by the Canadian government. The islands contain numerous summer-resorts which are extensively patronized. The river, with the system of canals established on its course above Montreal and with Lakes Ontario, Erie, St. Clair, Huron and Superior and connecting canals, affords water-communication from the Straits of Belle Isle to Port Arthur, at the head of Lake Superior, a distance of 2,200 miles. The distance to Duluth is 2,343 miles and to Chicago 2,272 miles. From the Straits of Belle Isle at the mouth of the St. Lawrence to Montreal the distance is 986 miles; from Quebec to Montreal 160 miles. Owing to the shallowness of the waters on a portion of the river between those two places, particularly through Lake St. Peter, vessels drawing more than 10 or 12 feet were formerly barred from passage for the greater part of the season of navigation. In 1826 the question of deepening the channel was mooted, but it was not until 1844 that dredging operations were begun. In that year the deepening of a new and straight channel was commenced; but the scheme was abandoned in 1847. In 1857 the deepening of the present channel was begun. At that time the depth of the channel at low water was ten and a half feet. By 1869 this depth had been increased to 20 feet; by 1882 to 25 feet; and by the close of 1888 the depth of 27½ feet at low water was obtained for 108 miles from Montreal to a point within tidal influence. This work is now continued by the government of Canada. The channel, which is lighted and buoyed, has a minimum width of 300 feet, extending to 550 feet at points of curvature. Navigation, closed during the winter months, is opened about the end of April. This work places Montreal at the head of ocean navigation, and here the canal-systems of the River St. Lawrence begin. The difference in level between the point on the St. Lawrence near Three Rivers where tidal influence ceases and Lake Superior is about 600 feet.

Saint Louis (*sānt lōō'is*), **Mo.,** the chief city on the Mississippi and the fourth of the United States, is on the west bank of the Mississippi, 21 miles south of the mouth of the Missouri. It stands on a gradual slope which has the average elevation of 100 feet above the river. The city has a river frontage of 19 miles and covers 62½ square miles. The geographical position of St. Louis and its river and railroad facilities have combined to make it a city of great and growing importance. It is the chief receiving and distributing point for a vast and rich territory to the west and southwest.

Transportation. The Mississippi River, which has ample depth in front of the city, was formerly the great highway of traffic to New Orleans and the gulf. It still carries a large volume of trade, although the traffic is now for the most part by rail. There are 27 lines of railroads entering the Union Depot. The Eads bridge over the Mississippi was opened in 1874 and is 1,524 feet long. It leads into a railroad-tunnel which extends 4,000 feet under the business portion of the city. The Merchants' steel-bridge, opened in 1890, is 2,450 feet long, including approaches. It is three miles north of the Eads bridge and a number of railways enter the city over it. A unique feature is Cupples Station, where nearly all of the freight brought into the city is handled. This establishment occupies almost four acres in the railroad-yards, on both sides of the main tracks as they leave the tunnel. Twenty buildings are near these tracks, which are occupied by representatives of some of the largest concerns of the city. The platforms for handling goods cover 50,000 square feet, and arrangements for handling the business are so perfectly systematized that a great saving of time in the loading and unloading of cars is secured, and the hauling of freight through the streets for transshipment is avoided. Union Station is one of the largest and finest structures of its kind in the world, the train-shed providing accommodations for no less than 32 trains of 11 passenger-coaches each at one time.

Industries. The manufactures of the city rank fourth in the United States, the capital invested in 1909 being $269,392,000 and the

value of manufactured products being $328,495,000. If the factories of East St. Louis and other outlying cities, which properly belong to this industrial center, were added, the aggregate would be greatly increased. The trade in dry goods amounts to $120,000,000 annually; the manufacture and sale of boots and shoes amount to $50,000,000; that of tobacco and cigars over $40,000,000; beer $18,000,000; and street-cars $15,000,000. Other lines are flour, glass, furniture, agricultural implements, iron and steel products, white lead, linseed and cottonseed oil, brick, slaughtering and packing. St. Louis boasts of the largest hardware company and the largest woodenware company in the world.

Streets and Sewers. Owing to the elevation of the city, perfect drainage is easily accomplished. There are 550 miles of sewers, 450 of paved streets and 350 of electric railway. The streets are numbered north and south from Market Street, which runs west from the river. The city is supplied with water from the Mississippi River, the waterworks having a capacity of 120,000,000 gallons daily. The income from the water-rates is used in the water-department only; and, as this produces a large revenue, plans are being made to filter the entire supply of city water and also to remove by legislation the evil of the Chicago sewerage.

Buildings. Among the notable public buildings are the court-house, built in the form of a Greek cross and having a dome almost 200 feet high; the city-hall, which cost more than $2,000,000; and the Federal building, which contains the custom-house, postoffice and United States subtreasury. Besides these, there are the Union Trust, the Equitable, the Merchants' Exchange and the United States arsenal and, among the hotels, the Planters', the Southern, the Lindell and the Jefferson. St. Louis has many beautiful churches, among them being the cathedral (R. C.), Rock Church (R. C.), St. George's (Episcopal), Shaare Emith Synagogue, Union Methodist Church and many others.

Parks. The public squares and parks occupy 2,198 acres, the four large parks being Forest, O'Fallon, Carondelet and Tower Grove and Shaw's Garden. This latter park is, properly, the Missouri Botanical Garden and was the gift of Henry Shaw. The ownership of the botanical garden is vested in a board of trustees which has the net income from four million dollars at its disposal, which enables it to extend and improve the garden constantly.

Education. St. Louis spends about $4,500,000 a year on its public schools, which are attended by 88,887 pupils. There are five high schools and a normal school accommodating 300 pupils; also a colored high and normal school for 300 pupils; in all there are 116 schools, 10 of which are for colored pupils. The evening schools enroll 9,263 and the city employs 2,433 teachers (1911). Washington University is a most generously endowed and handsomely equipped institution. Samuel Cupples and Robert S. Brookings, owners and builders of Cupples Station, have given the entire property to Washington University as a permanent endowment for the cause of higher education. It has 249 professors and 1,075 pupils. By the terms of its charter it is nonsectarian and nonpartisan. At various times it has added and now maintains the departments of law, engineering, architecture, medicine, dentistry and a school and museum of fine arts. St. Louis University (R. C.) dates back to 1829 and is a flourishing institution, with 220 professors and 1268 students. Its library of 38,000 volumes is rich in ancient books of many languages. There also are the Christian Brothers' school for boys, Forest Park University for girls, the convent of the Assumption and Mary Institute for girls and Smith Academy and the manual-training school for boys. St. Louis has the free public library, the Carnegie central library and branches and the Mercantile library.

History. In 1764 a company of merchants headed by Pierre Ligueste Lacléde, who had been given by the director-general of Louisiana the right to trade with the Indians on the Missouri, made a settlement at St. Louis. It was taken possession of by Spanish troops in 1768 and with the rest of Louisiana became a part of the United States in 1803. In 1780 it was attacked by a large body of Indians, who were driven off. For many years it was only a trading post for fur-traders. The first newspaper was started in 1808; and a year later St. Louis became a town. The city suffered from cholera in 1832 and from cholera and fire in 1849. In 1896 St. Louis was visited by a cyclone which swept through the heart of the city, causing great loss of life and destroying property to the value of over $25,000,000. Population 687,029.

St. Louis, capital of the French colony of Senegal in West Africa, is on a small island near the mouth of Senegal River. Bridges join it to suburbs on either bank. A sandbar makes the river-mouth dangerous to vessels, and freight is landed at Dakar on Cape Verd, 100 miles southwest, and brought to St. Louis by rail. Still, the place has a trade of $5,000,000 a year, its chief exports being gums and earth-nuts. The climate is unhealthy; water is brought to the town by an aqueduct seven and one half miles long. Population 24,070. See FRENCH WEST AFRICA and SENEGAL.

St. Mark's Cathedral, Venice, dates from the ninth century, although until 1807 it officially was only the chapel of the Doge's palace. It grew in splendor, however, with the growth of the power and pomp of Venice. Its oriental cupolas and spires were gradually erected; and the interior was beautified by

mosaics, silver and gilt work and precious stones in the most lavish detail. Over the porch at the center are set the bronze lions of St. Mark, once for a time the prey of Napoleon, but now once more to be seen in the city which they have beautified for centuries. The church and its chapels contain many fine paintings and rich treasures of art in statuary, plate and books. The great picture of St. Mark above the central doorway has been made from the drawings of Titian.

St. Ma'ry's Strait or **River** connects Lakes Superior and Huron, and forms the boundary between Ontario and the upper peninsula of Michigan. The strait is sixty-three miles long. One mile below Lake Superior are the rapids called the Sault Ste. Marie, below which the river spreads out into a broad lake. These rapids have a fall of 20½ feet, around which a canal was built in 1855, most of it cut through solid rock. In 1895 a canal was opened on the Canadian side.

St. Mau'rice' River, in Quebec, which runs from northwest to southeast, falling into the St. Lawrence. It rises at the height of land, is quickly swelled by the rivers along its course, and, when barely a few leagues from its source, is a majestic river, navigable in stretches of considerable length. Its total length in 369 miles and its average width 800 feet. Its chief tributaries are the Matawin, which carries down a great body of water, the Mekinac, the Bostonnais, the Croche near La Tuque and the Vermillion. The territory drained by the St. Maurice and its tributaries comprises about 16,000 square miles.

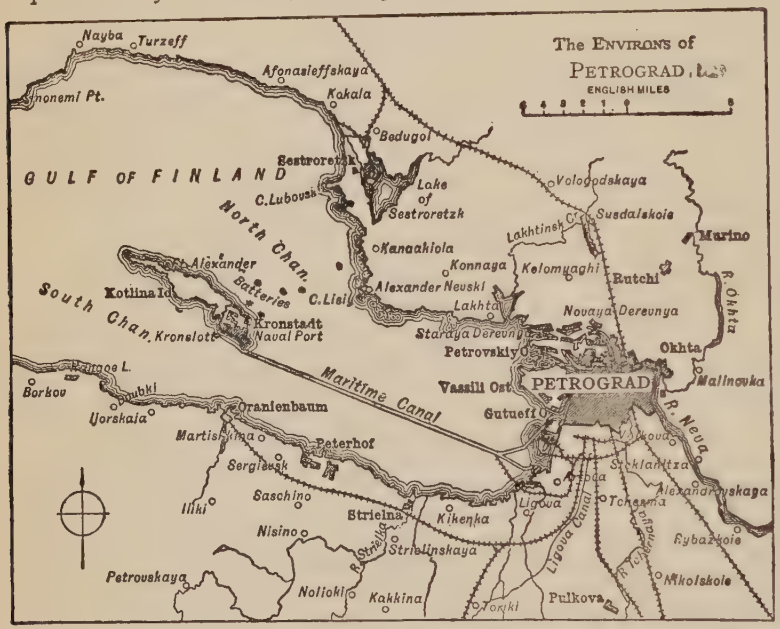
St. Mi'chael's College, Can., was established in 1852 at Toronto by the Basilian fathers from Annonay, France, at the request of the Rev. Dr. de Charbonnel, then Bishop of Toronto. It numbers amongst its earlier students Archbishop O'Connor of Toronto, Bishop O'Connor of Peterboro and Bishop Dowling of Hamilton. In 1881 the college was affiliated to the University of Toronto in order to have a relationship similar to that existing between similar institutions in England and Ireland and the London University. St. Michael's is a federated college and part of the University of Toronto. It is not, however, merely a theological college. It has commercial, classical and philosophical courses.

St. Paul, Minn., the capital of Minnesota, is on both banks of the Mississippi, of which it is the head of navigation. The city is built on two high plains; the business portion is on the lower plain of limestone rock and the most of the best residences are on the upper plain of glacial drift overlooking the Mississippi, one of the finest streets of which is Summit Avenue. Its buildings compare well with those of any city in the country, and include the state capitol, city-hall, postoffice, library, armory, Convent of the Good Shepherd, Auditorium, Y. M. C. A. and Y. W. C. A., the Catholic cathedral and the Pioneer Press, Manhattan, Germania and New York Life-Insurance buildings The manufacturing output amounts to $75,000,000 a year, and the stockyards do a business of $50,000,000. St. Paul is served by ten railroads, and electric cars carry passengers to all parts of the city. Twenty-nine thousand pupils attend the public schools, which are maintained at an annual cost of $850,000. There are three colleges: Macalester College (Presbyterian), Hamline University (Methodist) and St Thomas College (Roman Catholic). The city library has 460,000 volumes; and the library of the Minnesota Historical Society, in the capitol, 115,000 volumes.

The first log-huts were built in 1838 and 1839 on the site. In 1849, when St. Paul was made the capital of newly organized Minnesota Territory, the town had 840 inhabitants. Its population is 214,744, nearly four fifths of which is the growth of the last twenty-five years. St. Paul and Minneapolis are known as The Twin Cities, and have been growing steadily toward each other, so that they are practically one city, with a combined population of 516,152.

St. Pe'tersburg (now Petrograd), capital of Russia, stands at the head of the Gulf of Finland and at the mouth of the Neva. It is built on flat and low marshy ground, from which the sea is slowly receding, the Neva dividing into many branches, thus producing 100 islands, which all the time are getting larger. In this way nearly 600 acres have been added to Petrograd in the last 150 years. High winds sometimes raise the sea and flood the poorer parts of the city. In 1777, 1824 and 1891 rises of ten or more feet covered nearly the whole city with water. Petrograd is surrounded by wildernesses, the nearest city being Novgorod, and is almost wholly cut off from the rest of Russia. The chief connection is by railway and by the Neva, which is joined by canals with the Volga and so is the real mouth of Russia's greatest river. Founded by Peter the Great in 1702, the city has spread over the banks and islands of the Neva and now covers 42 square miles. A bar at the mouth of the river made *Cronstadt,* on an island 16 miles west, the real port, but the building of a ship-canal, 22 feet deep, now allows ships to unload within the city itself. Most of the city, the finest part, is on the mainland, bordered by a granite quay, with palaces and mansions stretching along the Neva for 2½ miles. The old Admiralty with its gilded spire is the center of the main part of Petrograd. From it starts the Nevski Prospekt, one of the finest streets in the world, not so much for its houses as for its great width and lengtn, its crowds and carriages. East of the old

Admiralty rises the huge and magnificent mass of the Winter Palace. On the island of Vasilievski are the stock-exchange, the University, the Academy of Sciences and the Academy of Arts. On Petersburgski Island stands the old fortress of St. Peter and St. Paul, containing the mint, the cathedral, in which the members of the imperial family are buried, and a political prison. Many islands are joined by bridges and covered by beautiful parks and summer houses. The chief manufactures are cottons, metals, leather, sugar and guns. But Petrograd owes its growth chiefly to foreign trade. Petrograd University and the many medical, technical, engineering, naval, military and other schools, as well as the Ladies' University, number many thousands of students. There are fine picture-galleries in the Academy of Arts and the Hermitage. The imperial public library has 1,200,000 volumes and 40,000 manuscripts. Population 1,870,000. Shortly after the Great War began, St. Petersburg was changed to "Petrograd," "grad" being Russian for "burg," which is German.



Saint-Pierre (*săn'-pyâr'*), **Jacques Henri Bernardin de,** was born at Havre, France, Jan. 19, 1737. As a boy he made a voyage to Martinique and studied at Caen and Rouen. He worked for a while as an engineer, made voyages and journeys, was a disciple of Rousseau, and wished to found an ideal state on the shores of the Sea of Aral. It was not till 1771 that his first book appeared, *Voyage to the Isle of France*, which at first was hardly noticed. He is remembered chiefly as the author of the beautiful story of *Paul and Virginia*, which was quickly scattered over Europe in English, Italian, Spanish, Dutch, Polish and Russian translations. Napoleon took it with him on his Italian campaign, re-read it at St. Helena and heaped many favors on St. Pierre, which enabled him to spend his old age comfortably among his flowers at his country house at Éragny, where he died on Jan. 21, 1814.

St. Quentin (*săn-kăn'tăn'*), a French city on the Somme, 95 miles northeast of Paris. The church of St. Quentin and the town-hall are fine Gothic buildings. There are large cotton and other mills, and vast quantities of embroidery are made. Two important battles were fought here. Spanish and English troops won a victory over the French under Montmorenci in 1557, followed by the surrender of the city to the Spaniards, though bravely defended by Coligni. On Jan. 19, 1871, the Germans under Von Goeben defeated the French under Faidherbe, capturing nearly 10,000 prisoners. Population 58,571.

Saint-Saens (*săn'-săn'*), **Charles Camille,** a distinguished French musician, was born in Paris in 1835. He showed musical talent even as an infant; and at 16 wrote a symphony. For many years he was organist at the Madeleine Church in Paris. His earlier operas were unsuccessful; but his *Henry VIII*, *Ascanius* and *The Barbarians* have been well-received. Saint-Saens, however, is more famous as a composer of instrumental symphonies than of opera. He was an admirable performer as well as critic. He was made a commander of the Legion of Honor in 1894. No modern French composer has done more to maintain the classical tradition in instrumental music.

Saint-Simon (*sănt-sī'mŭn*), **Claude Henri,** Count of, the founder of French socialism, was born at Paris, Oct. 17, 1760. Like other French nobles he showed his love for liberty by serving as a volunteer in the American Revolutionary War. However, he took very

little part in the French Revolution, except to undergo a short imprisonment. His first work was *Letters of a Citizen of Geneva to His Contemporaries*. His last and most important was *New Christianity*. He suffered hardships from lack of means, often being without dec nt clothes and food. This poverty caused him to try to shoot himself, in which attempt he lost an eye, two years before his death, May 19, 1825.

Saint-Simon, Louis de Rouvroy, Duke of, was born at Paris, Jan. 16, 1675. He served as a soldier in the wars of Louis XIV and took a leading part as courtier and politician at court. He is remembered for his *Memoirs*, which were not published in full till 1830. They are a masterpiece of art and are said not to be equaled by any work of the kind yet written. He died at Laferté, March 2, 1755. See Henry Reeve's *Royal and Republican France*.

St. Thom'as, Can., county-seat of Elgin County, Ont., is a growing railway-center with 11,485 inhabitants, in the midst of a rich agricultural country and possessed of thriving manufactures.

St. Thomas (Portuguese Sao Thomé) constitutes with the island of Principé a Portuguese colony. It lies in the Gulf of Guinea, off the western coast of Africa. Its area is 360 square miles, its fertile valleys unhealthy, its windswept peaks salubrious. In 1900 it had a population of 37,776. The exports are largely cacao, coffee and cinchona. The population is almost wholly composed of negroes. It was discovered by the Portuguese on St. Thomas's day in 1471, and colonized by them in 1493. From 1641 to 1844 the Dutch occupied it.

St. Vin'cent, Cape, forms the southwestern corner of Portugal, off which two important battles have taken place. On June 16, 1693, the French fleet defeated the English Admiral Rooke, who lost 12 men-of-war and 80 merchantmen that were sailing under his convoy. On Feb. 14, 1797, the well-known battle was fought in which Earl St. Vincent, ably seconded by Lord Nelson, with 15 sail of the line and 7 frigates defeated the Spanish with 27 sail. This victory prevented the invasion of England by France.

Sainte-Beuve (*sănt'-bēv'*), **Charles Augustin,** the greatest literary critic of modern times, was born at Boulogne-sur-Mer, France, in 1804. His father died before his birth, and his mother had a hard struggle to find means to give her son a schooling. At 14 Charles went to Charlemagne College at Paris, and afterward studied medicine. In 1824 he began his literary career by becoming a regular contributor of *Le Globe*, a paper started in that year by one of his college professors. A review of Victor Hugo's *Odes and Ballads* made him a lifelong friend of that poet. His best work as a critic began in 1840, when he was made keeper of Mazarin Library. In 1849 he began to write, for *Le Constitutionel*, an article on some literary subject every Monday, and this was his work for 20 years. These *Monday Talks* fill 28 volumes, and on them his fame chiefly rests. Sainte-Beuve died at Paris, Oct. 13, 1869.

Ste. Cunegonde, a substantial suburb of Montreal and also in Hochelaga County, has 10,912 inhabitants. It lies southwest of the city.

Saki (*sä'kĭ*), a kind of beer which the Japanese make from rice. It is the common drink of Japan. It is clear, and tastes unpleasant to Europeans. It is usually drunk hot, out of flat cups or lacquered-wood saucers.

Sal'aber'ry, Charles de, the hero of Chateauguay, a member of the old, French, landed nobility, had seen distinguished service under the British flag abroad when the War of 1812 broke out. He assisted in raising and took command of a regiment of French-Canadian *voltigeurs*, who saw a great deal of service in Lower Canada through the war. At Odelltown he resisted Gen. Dearborn with 2,000 men so successfully that the Americans were compelled to retire on Champlain. Salaberry was in command of the advance-guard, numbering not more than 350 men, at Chateauguay on Oct. 23, 1813, when Gen Wade Hampton with 3,500 Americans appeared. Stationing his main force behind breastworks and assigning small parties of men with bugles to posts well-separated through the surrounding woods, by repelling the frontal attack and pressing a counter-attack at the ford of the river he drove the enemy into precipitate retreat and inflicted heavy loss. For this he was knighted, and his men each received a medal. A monument to his memory was dedicated at Chateauguay in 1895.

Saladin (*săl'ȧ-dĭn*), the name given by western writers to Salah-ed-din Yusuf ibn Ayub, the sultan of Egypt and Syria. He was born in 1137 at the castle of Tekrit on the Tigris, of which his father, a Kurd, was governor under the Seljuk Turks. He rose to be grand vizier and in 1171 master of Egypt, overthrowing the reigning caliph. Three years later the emir died, and Saladin proclaimed himself Sultan of Egypt and Syria, a title which was confirmed to him by the caliph of Bagdad. He next conquered Mesopotamia and received the homage of the Turkish princes of Asia Minor. He then turned his attention to the Christians, utterly defeating them near Tiberias in 1187; next Jerusalem was stormed (Oct. 3); and almost every other fortified place on the Syrian coast was taken. The news of this great success aroused the Christians of western Europe, and a powerful body of crusaders, headed by the kings of France and England, soon appeared on the scene

of strife. They captured Acre in 1191, and Richard Cœur-de-Lion defeated Saladin, took Cæsarea and Jaffa, and obtained a treaty for three years by which the coast from Jaffa to Tyre was yielded to the Christians. Saladin died at Damascus, March 3, 1193. Saladin was not merely a great soldier; his wise government left traces which lasted for centuries in the citadel of Cairo and in canals, dikes and roads. He lives in history as the Moslem hero of the third crusade and as the Moslem ideal of chivalry. The chivalrous side of his character is seen in Scott's *The Talisman*.

Sal'aman'ca, a Spanish city on the Tormes, 110 miles northwest of Madrid. From the 13th to the end of the 17th century it was the seat of one of the most renowned universities in Europe. In the 16th century there were from 6,000 to 8,000 students; now there are some 1,200. The library contains 70,500 volumes. The city, which once had a population of 50,000, is still surrounded with walls, pierced by ten gates. Its houses, convents, churches, streets and squares preserve much of their appearance during the middle ages. The great square was used for bullfights, and can hold 20,000 spectators. The town was captured by Hannibal in 222 B. C. The Moors were driven out of it in 1055. The French captured it in 1812. Population 24,000. Salamanca also is a province; area 4,829 square miles; population 320,765.

Sal'aman'der, a tailed amphibian, with a body shaped like a lizard and often mistaken for one of those reptiles. The group includes mud-puppies, newts and the like.

COMMON MUD-PUPPY, WITH EXTERNAL GILLS

They are abundant in many places both in the Old and the New World. Several kinds of *Amblystoma* are very common in the United States. The commoner forms are six to eight inches long. They have blunt noses, and are dark-colored with yellow spots and blotches. They lay their eggs in quiet waters, preferring small ponds in which the water is easily warmed. The eggs are hatched into tadpoles, with external gills. The tadpoles grow to a length of five or six inches before the gills are dropped and replaced entirely by lungs. The adults live on land, going into the water to lay eggs. Some salamanders, like the Mexican axolotl and the common mud-puppy (*Necturus*), live habitually in the water and retain their external, feather-like gills throughout life. The salamanders are divided into those which retain and those which lose their gills. Most salamanders lay eggs, but one form (*Salamandra atra*), living on the Alps, brings forth living young. Though regarded with fear by many people, salamanders are harmless.

Salamis (*săl'ă-mĭs*), **Battle of.** This great naval battle was fought between the Greeks and the Persians in 480 B. C., a few days after the battle of Thermopylæ, in the narrow strait between the island of Salamis and the coast of Attica. The Greek fleet of 366 triremes was drawn up at the entrance of the bay forming the harbor of the town of New Salamis, the Athenians under Themistocles, the Corinthians under Adimantus, while the Spartan Eurybiades commanded the whole. Quarrels among the Greek leaders would probably have caused the fleet to break up, had not Themistocles by a stratagem got Xerxes, the Persian king, to bring up his fleet and give battle at once. Xerxes drew up his fleet, numbering 1,200 triremes and 3,000 smaller vessels, during the night before the battle, to block both entrances to the strait. Sure of victory, he took his seat on a throne on a lofty height on the Attic coast. Both Greeks and Persians fought with great bravery, but the latter were defeated, the Greeks being victorious in one of the most important sea-fights of history. It was one of the world's decisive battles.

Sa'lem, a city in the south of India, 120 miles southwest of Madras. It stands in a valley backed by hills. It has large cotton-mills and a good general trade. Population 70,621.

Salem, Mass., city, settled 1626, chief county-seat of Essex County, on the Boston and Maine Railroad, Eastern Division, 17 miles by rail northeast of Boston. Its harbor, an arm of Massachusetts Bay, is well-sheltered and commodious, but of insufficient depth for the largest vessels. The city is a popular resort for people interested in early American settlements, possessing many historic localities and buildings. Essex Institute contains a large collection of relics and portraits and a library of 82,850 volumes and 285,922 pamphlets and serials, many of which treat of historic subjects. East India Marine

Museum has a rare exhibit of ethnological value and many other objects of varied interest. The Athenæum contains 25,000 volumes, and the free public library has upward of 40,000. Besides a well-sustained system of public schools, it has three parochial schools and is the seat of a flourishing state normal school. It has 21 churches, a Y. M. C. A. organization, with a fine, large building, an endowed institution for work among boys, known as Salem Fraternity, and a well-equipped and well-endowed hospital, which accommodates 100 patients. The city has been unjustly identified with the witchcraft delusion of 1692 from the fact that the courts sat here at which the accused were tried. The recovery from this delusion was earlier here than in other parts of this country or in England. (See MATHER, COTTON, and WITCHCRAFT). The city formerly enjoyed a large and extensive foreign commerce. This has become superseded by an extensive coasting-trade, of which the reception of coal for distribution by rail and the shipment of ice form the chief items. Population 43,697.

Salem, Or., the capital, is on Willamette River, 52 miles southwest of Portland. It has good water-power and some manufactures. Here are the capitol, penitentiary, insane asylum, schools for the blind, deaf and dumb and feeble-minded, besides Willamette University (Methodist) and an excellent system of public schools, enrolling 2,000 pupils and employing 45 teachers. Salem was settled in 1834, and became the capital in 1860. It is served by the Southern Pacific Railroad, and has electric connection with Portland. Population 14,094.

Salerno (*sȧ-lēr'nō*), a city of southern Italy, on the Gulf of Salerno, 33 miles southeast of Naples. An old Norman castle surmounts the hill behind the city. The beautiful Gothic cathedral of St. Matthew has a quadrangle of porphyry and granite pillars in front of it. The city was celebrated in the middle ages for its university. Population 42,727.

Sal'ic Law, a collection of the popular laws of the Salic Franks, in which the succession to what are called Salic lands was confined to males, probably from the importance of getting military service from the chief land-owners. This law was afterwards applied to the succession to the French crown.

Salisbury (*sąlz'bĕr-ĭ*), a cathedral city of England, stands near Avon River (not Shakspere's), 84 miles southwest of London. Its famous cathedral is built in early English style, and is 473 feet long and 111 wide, the spire is the highest in England — 400 feet. In the large close which surrounds the cathedral is the bishop's palace. Blackmore Museum contains a fine collection of American antiquities. Among the bishops have been Cardinal Campeggio, Jewell, Hooker, Fuller, Barrow, Liddon and Wordsworth. Old Sarum, a mile north of the present city, was a castle and a place of importance in Roman times. Here Canute died, and here William the Conqueror gathered the barons to renew their oath of fealty. Population 21,900.

Salisbury, Robert A. T. Gascoyne Cecil, Marquis of, English statesman and prime minister, was born at Hatfield, Herts, Feb. 3, 1830, and educated at Eton and at Christ Church, Oxford. In 1866 he entered Lord Derby's ministry as secretary of state for India (under the title of Lord Cranbourne). On the death of his father in 1867, he entered the house of lords and took rank as the foremost debater in the upper chamber. In 1878 he acted as joint plenipotentiary of Great Britain at the Congress of Berlin, and two years later became secretary of state for foreign affairs. When the Earl of Beaconsfield died in 1881, Lord Salisbury became the recognized leader of the Conservative party. When the Gladstone ministry resigned in 1885, he became premier and secretary for foreign affairs. Owing to feeble support received by his government he resigned affairs to Mr. Gladstone, but, on the latter being defeated on the second reading of the Irish Home-Rule bill, he again returned to power. In 1892 Mr. Gladstone and he once more exchanged the premiership, and in 1895, on the resignation of Lord Rosebery, Lord Salisbury formed his third adminstration, in coalition with Liberal-Unionists, from which he retired in 1902. In 1864 he was elected chancellor of the University of Oxford. In his younger days he was a contributor to *The Quarterly Review*, but later found relaxation from the cares of office in his laboratory, where he experimented in chemistry and electricity. He died on Aug. 22, 1903.

MARQUIS OF SALISBURY

Saliva (*sȧ-lī'vȧ*), one of the digestive fluids, is mainly the product of the salivary glands, of which there are three kinds, named from Greek and Latin words denoting their position — the parotid, the submaxillary and the sublingual, with ducts or canals which carry the saliva into the mouth. Here it is mixed with mucus, from the mucous membrane lining the mouth, forming ordinary or mixed saliva.

The parotid gland is the largest of the three glands, found on each side. It lies on the side of the face just in front of the ear. Its duct is about two and a half inches long and opens into the mouth opposite the second molar tooth of the upper jaw. The submaxillary gland is below the jaw-bone; and the sublingual gland is under the tongue on the floor of the mouth. Salivary glands are found in most of the higher animals except fishes.

Sallee', a seaport of Morocco, stands on the Atlantic, at the mouth of the Bu-Rakrak. It for centuries was notorious as a haunt of pirates, who carried the terror of their name far and wide and known to every reader of *Robinson Crusoe*. The people, 10,000 in number, allow no European to dwell within their walls, though a stop was put to their piracy at the beginning of the 19th century. Population about 10,000.

Sal'lust, a Roman historian, was born of a plebeian family at Amiternum, in the Sabine country, 86 B. C. As a follower of Cæsar, he rose to be tribune in 52 and prætor five years later. He took part in Cæsar's African campaign, came near being killed in a mutiny of some of the troops, and was made governor of Numidia. This office enriched him, and enabled him to lay out beautiful gardens on the Quirinal, which bore his name for centuries, and to build the palace used afterwards by Emperors Nerva, Vespasian and Aurelian. Here he wrote his famous histories, *Catiline*, *Jugurtha* and the *Five Books of History*, of the last of which only a few fragments are known. Sallust died in 34 B. C.

Salmon (*săm'ŭn*), several species of fish belonging to the trout family and ascending rivers to spawn. They, of course, are found abundantly during migration in fresh water, but, as they feed mainly in salt

KING-SALMON

water, they may be regarded as marine fishes. They occur on the shores both of the eastern and the western continent. They are essentially cold-water fish, in Europe ranging north of Spain and on the eastern coast of North America from Maine northward, being sometimes found as far south as the mouth of the Hudson. The salmon of the Pacific, so abundant in Columbia and Yukon Rivers, belongs to another genus. This kind is more tolerant of warm water and occurs on the coast and in rivers of California. The North Atlantic salmon is brownish above, with silvery sides, spotted with black. These spots often are in the form of an S. Its delicate reddish-orange flesh makes it highly prized as a table-fish. The average weight of an adult is about 15 pounds. Very similar forms are found in Great Britain, Europe, Norway, Russia, Eastern Asia and Japan. The salmon of the western Pacific coast are larger. They ascend the Yukon 1,500 miles. The king-salmon is the largest, and is known to reach a weight of 100 pounds, although those weighing 40 or 50 pounds are considered very large. The average weight is about 22 pounds. In migrating they are able to leap over vertical waterfalls six or eight feet high, when there is considerable depth just below the falls, and they ascend swift rapids of much greater height. There are four other varieties on the Pacific coast associated with the king-salmon, but all of smaller size. The young fish at first live in the fresh water and are successively called parr, smolt and many other local names. Going into salt water after one to three years with a length of six inches, they develop rapidly, and, in a few months, reach a weight of several pounds. They are now called grilse and return to fresh water to spawn. On going to the sea again after their first spawning, they are called salmon and thereafter bear that name. The most extensive factories for canning salmon are on Columbia River. The fish canned in this region are shipped all over the world. To-day the value of the salmon catch in the United States exceeds $20,000,000. See Buckland's *Fish-Hatching* and Traherne's *The Habits of the Salmon.*

Salome', a feminine name common in Palestine in the days of Christ. The notable Salome was the granddaughter of Herod the Great, who married her uncle Herod, the tetrarch. She appears in the Gospels as a young girl who was instigated by her mother, Herodias, to ask the execution of John the Baptist. Her skillful dancing induced Antipas to make the rash vow that led to the death of the prophet.

Salome, an opera by Richard Strauss, has been the subject of much discussion in musical circles and even of popular protest in France and the United States. It portrays the story of Salome and her dance before Herod and his guests, being based on the one-act drama of Oscar Wilde, who imputes to Salome a passion for the prophet which leads her to repulsive actions. The keynotes are passion, terror and overshadowing destiny.

Salonica (*să'lō-nē'kă*) or **Saloniki,** the most important city for trade in European Turkey after Constantinople. It stands at the head of the Gulf of Salonica, and since 1889 has been joined to Belgrade and

Vienna by rail. It has a fine appearance from the sea, as it is surrounded by white walls five miles long, and its houses and mosques are shaded by dark-leaved trees, while a citadel, the old Acropolis, looks down from the rocky heights above it. The main buildings are the mosques, most of them now Christian churches; among them are St. Sophia, St. George and St. Demetrius. The old mosque once was a temple of Venus. Here is the court of the hippodrome where Theodosius ordered the massacre of 7,000 citizens. *Via Equatia*, the highroad from Rome to Byzantium, passes through the city. Trade is steadily growing, especially since the opening of the railroad to Servia. Cotton, flour, soap, bricks, leather, silk and carpets are among its manufactures. Salonica is the Thessalonica of the Christians, to whom St. Paul wrote *Thessalonians I* and *II*. The town was founded by Cassander in 315 B. C., who named it after his wife, sister of Alexander the Great. Population about 150,000; of whom nearly 61,000 are Jews of Spanish descent, 25,000 are Turks and 14,000 Greeks. Salonica also is a vilayet in Turkey; area 13,510 square miles; population 1,130,800.

Salt. Common salt is chloride of sodium (NaCl). It occurs in nature both in beds or strata, when it is called rock-salt, and in solution in water. Aside from the sea and from salt lakes, the underground waters of many regions contain salt. The salt of commerce is partly mined from the beds of rock-salt, partly extracted from salt waters. In the latter case the brine may be natural, as in the case of the sea, salt lakes and salt wells; or artificial. In the case of artificial brines fresh water is allowed to flow over beds of salt, and from the resulting solution salt is extracted. In the extraction of salt from salt water two general processes are in vogue. In one the water is allowed to evaporate in the open air under the influence of the sun; and in the other evaporation is hastened by means of artificial heat. By the former process the *coarse salt* and by the latter the *fine salt* of commerce are obtained. Beds of rock-salt represent deposits from solution on the bottoms of salt lakes, lagoons etc. In some lakes, as Great Salt Lake, such deposits are being made at the present time. Similar deposits have been made in the past, and subsequently buried by other sediments, as sand, mud etc. Some of these beds of salt were made millions of years ago. Some are hundreds of feet thick. The salt in solution in underground waters may have been derived from salt-beds over which the waters seeping in from the surface have passed, and some of the natural brines may represent sea-water with which the sediment was originally filled and which has never been drained out. The thickest salt-beds of this country, so far as now known, are on the coast of Louisiana, on Avery's Island (*Petite Anse*). Other salt-beds occur in New York, Pennsylvania, Ohio, Michigan and Ontario, Canada. The output of salt in the United States in 1906 was 28,172,380 barrels (280 lbs. per bbl.), value $6,658,350. The United States produce more salt than any other country. Great Britain, Russia, Germany, France, India, Spain and Italy are great producers in the order named. The total product for the world in 1901 was more than 12,000,000 short tons.

Salt Lake City, capital of Utah, is on Jordan River, twelve miles from Great Salt Lake and 4,265 feet above the sea. It covers twelve square miles. Its streets are 132 feet wide, shaded by fine trees, many of them freshened by streams of running water from the neighboring mountains, and lighted by electricity. The finest public buildings are the Mormon temple, which cost $4,000,000, with walls built of dressed granite, twenty feet thick at the bottom, tapering to six feet at the top; the tabernacle, a huge building in the shape of an ellipse, with a dome-shaped roof resting on sandstone pillars, and seating 7,000; and the city and county building. Though Mormon influence is strong, there are Roman Catholic, Episcopalian, Presbyterian, Congregational and Methodist churches. St. Mark's cathedral (Episcopalian) the cathedral (Roman Catholic) and the First Presbyterian Church are the finest Gentile churches. The city is the center of large mining-industries, and has smelting-works, flour and paper mills, foundries, machine-shops, breweries and tanneries. It has good free public schools, supported at an annual cost of $500,000, and an enrollment of 15,500. Here is the University of Utah, a coeducational institution supported by the state, having 53 instructors and 957 students, including the preparatory department. There also are denominational schools. Salt Lake City was founded in 1847 by Brigham Young who, with a company of Mormon pioneers, left Council Bluffs in the spring to find a site for the future Mormon capital. For years the growth of the city depended upon the inflow of Mormon immigrants, but later the mines in its vicinity attracted Gentiles or non-Mormons. The population of the city is 92,777.

Salt'peter or **Ni'ter** is potassium nitrate (KNO_3). It generally is in long, colorless, six-sided prisms. Its taste is cooling and very salty. It dissolves in water but not in alcohol. Mixtures of niter and carbon or of niter and sulphur or of all three explode with great energy on applying heat. If saltpeter be thrown on glowing coals, it flashes briskly. Niter is found in India and Persia as a natural product, on the soil or scattered through the upper rocks. But most saltpeter is now made from the Chilean sodium nitrate. Niter is used in making sulphuric acid, nitric acid, fireworks and, especially gunpowder. It also is a medicine. Sodium

nitrate is found abundantly on the surface of the soil in Chile and Peru in the form of cube-like crystals, and so is often called cubic niter. Besides its use in the manufacture of saltpeter, it is a valuable fertilizer. In 1905 1,688,976 tons of this nitrate or Chilean saltpeter, as it is called, were shipped from Chilean ports. See W. H. Russell's *Visit to the Nitrate Fields of Tarapacá.*

Salts make a very important class of substances in chemistry, of which common salt or sea-salt is the most familiar example. Epsom salts, saltpeter and Rochelle salts are other well-known salts. Common salt was known from the earliest times, and the name was given to other substances from the greater or smaller likeness of these to common salt in appearance, taste, solubility etc. But many substances, which have entirely different physical properties, are now called salts by chemists, and it is not necessary, from a chemical standpoint, that a salt should be white, soluble in water or have a salty taste. By a salt is ordinarily meant a substance that may be got from an acid by replacing part or all of the hydrogen of the acid by a metal, or a substance capable of playing the part of a metal, as ammonium. For example, when nitric acid and oxide of lead act upon each other, the acid loses its hydrogen, the place of which is taken by the lead, thus forming lead-nitrate, while the hydrogen of the acid and the oxygen of the lead-oxide combine to form water. In neutral or normal salts the hydrogen of an acid has been wholly replaced by a metal; in acid salts only partially replaced; and in basic salts more than replaced, there being more atoms of metal in the salt than there were atoms of hydrogen in the acid.

Salvador (*săl'vȧ-dōr'*), the smallest but most thickly populated of the Central American republics, is 140 miles long and on an average 60 miles wide. It covers 7,225 square miles, and is about as large as New Jersey. The bulk of Salvador is a level plain, 2,000 feet high, cut by rivers and broken by many volcanic peaks from 4,900 to 6,900 feet high. Some of these volcanoes are still active, and Izalco has been in eruption for over a hundred years. On the northern frontier is a portion of the Central American cordillera. The chief rivers, all of which flow to the Pacific, are the Lempa, which receives the waters of Laguna de Cuija, a large lake on the borders of Salvador and Guatemala, and the San Miguel. The well-watered and rich soil is divided into small farms, which will yield four crops of corn a year. The main products are coffee, indigo and balsam; the balsam grows only on one part of the seaboard, called the balsam-coast. Gold, silver, coal and iron are found, but the metal yield is not great. The bulk of trade is with the United States and Great Britain. The whites number only 20,000 most of the people being Indians or of mixed race. The Indians are Aztecs, speak Spanish and are Roman Catholics. A president, chosen for four years, a cabinet of four secretaries and a congress elected once a year carry on the government. Education is free and compulsory. The army numbers 3,000 men, besides 18,000 militia. A railroad connects the capital, San Salvador (population 60,000), and the chief port, Acajutla. Another road is planned to run from La Union, the best harbor, to San Miguel and thence to San Salvador. Salvador's first name was Cuscatlan. Pedro de Alvarado had great trouble in conquering it in 1525–6. The country freed itself from Spain in 1821, and two years later joined the Central American Confederacy. Since 1853 it has been an independent republic; it has been without foreign wars since 1864, with the exception of the short war with Guatemala in 1890. This war ended the proposed treaty of union between the five Central American states. Population 1,116,253, an average of 154 to the square mile. See Bates' *Central America.*

Salva'tion Army, a religious body which was founded in England in 1865 by the Rev. William Booth. The Salvationists' beliefs do not differ greatly from those of other Christians, but their methods are entirely new. Mr. Booth's idea was to reach the poorer classes of London by means of a military organization, and in this work he was ably seconded by his wife. The name of Salvation Army was adopted in 1878, and its head was thereafter known as General Booth. Its growth has been wonderful, there now being 7,316 posts, with 20,054 officers, in fifty-one countries in every part of the world. A country is mapped out into districts, each under the care of a major. Every large town in a district is occupied by one or more corps under a captain, with lieutenants to assist him. Their work is to carry on daily services indoors and out of doors, care for recruits and work in every way for the salvation of souls, and they are supported by the army. Services are held in the streets, with processions, accompanied by banners, drums and tambourines. All are bound to abstain from liquor and to lead unselfish lives. One who can hardly read is as welcome as the cultured, and women as well as men are enlisted and can hold any position. The army is supported by offerings, gifts and the profits of their press, of which *The War-Cry* is the best-known. The army periodicals, issued in 24 foreign languages, have a circulation of 1,207,000 weekly copies. Counting books, song-books etc., their publications have a circulation of nearly 4,000,000 a month. In 1890 a scheme for uplifting the out-of-work and homeless multitudes, set forth in General Booth's book, *In Darkest England and the Way Out,* attracted wide attention, and funds were collected to enable him to carry out his plan. By this plan out-

casts are first taken into a city-colony, given shelter and food and offered work. If found willing to work and do right, they are then sent to the farm-colony and afterwards shipped to the colony over the seas as emigrants. In 1896 Ballington Booth, son of General Booth, who had for some years been in charge of the Salvation Army in the United States, separated from the parent society and established a new organization, named The Volunteers of America. In character, aims and methods this organization is similar to the Salvation Army. See General Booth's book and his *Aggressive Christianity*.

Salvini (*sȧl-vē'nē*), **Tommaso,** was born at Milan, Italy, Jan. 1, 1830, of a family of actors. The boy had a good training and became well-known as a member of Ristori's company. In 1849 he fought in the war for Italian independence, after which he went back to the stage. He played tragic parts, especially Œdipus, Saul and Othello. He was popular and successful at Paris, Madrid, Brussels, in England and in the United States, which he visited in 1874 and 1881. In 1884 Salvini left the stage and retired to his villa near Florence. He died in 1896.

Alexander Salvini, son of the above, followed his father's profession, and gained considerable reputation, appearing successfully in the United States in the *Three Guardsmen* and other plays.

Samarcand (*sȧm'ȧr-kȧnd'*), a city of western Turkestan, 130 miles southeast of Bokhara in Russia in Asia. Under its old name of Maracanda it was taken and destroyed by Alexander the Great. Since its çapture in 712 A. D. by the Arabs, it has been a sacred Moslem city. Genghis Khan took it in 1219 and killed three fourths of its half million people. Timur the Great made it his capital in the 14th century, when it had a population of 150,000. From Timur's time date its finest buildings, as the Ulug-bed College, the tombs of the conqueror and his wives and the great stone which he used as a throne. Samarcand had a checkered history from the decay of Timur's empire, till in 1868 it was taken by the Russians from the emirs of Bokhara. A railroad now joins Samarcand to Merv and the Caspian Sea. The many gardens are irrigated; manufactures of harness, pottery etc. are carried on; and there is a brisk trade in silk, rice, horses etc. A garrison of 6,000 Russians holds the citadel, which is built on a steep hill. Population 58,194.

Sama'ria, the capital of the northern kingdom of Israel, after the ten tribes became independent of Judah. It was founded by Omri. It was about five miles northwest of Shechem, and thus near the middle of Palestine. It stood on the top of a hill 1,450 feet high, and was easily made a place of considerable strength. The Syrians besieged it in vain, but about 721 B. C. it fell before the attacks of the Assyrian kings, Shalmaneser and Sargon. Nearly all the Hebrews of the capital and country were carried captives into Babylonia. Their places were taken by Assyrian colonists. These settlers, though still keeping a good deal of their heathen ways of worship, adopted for the greater part the religion of the Israelites; but the refusal of the Jews to accept their help in rebuilding the temple at Jerusalem caused bitter feeling; and in 409 B. C. the Samaritans built a rival temple on Mt. Gerizim. This enmity between the Samaritans and the Jews became so great, that the 'Jews had no dealings with the Samaritans" and the Samaritans none with the Jews. Alexander the Great captured Samaria, and brought there a colony of Greeks. John Hyrcanus, the Jewish captain, after a year's siege took Samaria and razed it to the ground about 110 B. C. But the Samaritans clung to the spot, and after a bloody siege by the Romans saw their city a second time destroyed. Samaria was, however, rebuilt, and held by Herod the Great. The place is now but a heap of ruins, and most of the Samaritans were, like the Jews, scattered to the four winds; yet as late as 529 the few left rose in rebellion against the Eastern Empire.

Samoa (*sȧ-mō'ȧ*), is the name of a group of islands in the Pacific, from 400 to 500 miles northeast of Fiji. All but one are of volcanic formation, and are mostly surrounded by coral reefs. They are mountainous, well-wooded, with rich soil. Only four are of any size. The largest, Savaii, is 47 miles long and 28 wide. Upolu has on its northern side the bay and harbor of Apia, while on the shore of the bay is Apia, the chief town of the islands. In the spring there are disastrous hurricanes. Copra, the dried kernel of the cocoanut, is the chief export. Cotton, coffee and tobacco are cultivated, and sugarcane grows wild. Steamers ply between Apia and San Francisco, Auckland and Sydney. The Samoans belong to the brown Polynesian race. They are a well-formed people, but lessening in numbers, the present population being about 35,000. The Frenchman Bougainville visited the islands in 1768, and called them the Navigators' Islands, from the skill of the native boatman. The natives are Christians. By treaty, in 1889, the United States, Great Britain and Germany assumed joint control of the islands. This arrangement continued in force till 1898, when King Malietoa Laupepa died, and disturbances arose regarding the succession. A joint commission which was appointed recommended, among other measures, the abolition of the kingship. The result was that, by the Anglo-German agreement of Nov. 14, 1899, accepted and ratified by the United States in January, 1900, Great Britain renounced all rights over the islands in favor of Germany as regards Savaii and Upolu and in favor of the United States as regards Tutuila and other islands.

In February, 1900, a naval governor was appointed for Tutuila. The island of Tutuila, 70 miles from Apia, has an area of about 54 square miles, with a population of 3,800. Manua and the other islets have a united area of about 25 square miles, with about 2,000 inhabitants. Tutuila is mountainous, luxuriantly wooded and fertile. It is described as the most pleasing of the Samoan islands. The harbor at Pago-Pago, which penetrates the south coast, is the only good harbor in Samoa. The German islands of Savaii and Upolu have a combined area of 1,000 square miles, with a population of 33,000.

Sa'mos, an island in the Ægean Sea near the Asia Minor coast. It covers 180 square miles. A chain of mountains runs through the island. Between it and the mainland runs the mile-wide channel of Mycale, where in 479 B. C. the Persian fleet was routed by the Greeks. The main product is wine, though olive-oil, raisins and hides are also exported. Tanning is an important business. The capital is Vathy. The old city of Samos is now called Tigani. It was celebrated for its aqueduct, cut almost a mile through the heart of a mountain; a huge mole built to protect the harbor; and its temple to Hera. In early times famous red pottery was made in Samos. The Samians, like the Corinthians, were among the earliest and most daring sailors; a Samian is said to have first passed the pillars of Hercules into the Atlantic; and Samos was the mother of colonies in Thrace, Cilicia, Crete, Italy and Sicily. The island was mistress of the Ægean Isles under its greatest ruler, Polycrates (532–522 B. C.). No Greeks were more patriotic than the Samians in the War of Independence in 1821, but they were forced, though the rest of Greece became free, to remain in the hands of their masters, the Turks. The island is, however, governed by a Greek who is called Prince of Samos. Population is 54,840. See Tozer's *Islands of the Ægean.*

Samothra'ce or **Samothra'ki** is an island in the northeast of the Ægean Sea. Mt. Saoce, 5,248 feet high, takes up nearly its whole surface, sixty-eight square miles. From this peak Poseidon watched the combats on the plain of Troy. Samothrace for many years was a sacred spot, where were worshipped the strange gods known as the Cabeiri. In 1457 and again in 1821 the Turks killed nearly all its people. Population about 2,000. See Marston's *Greece and the Ægean.*

Samp'son, William T., rear-admiral of the United States navy, was born at Palmyra, N. Y., in 1840. He graduated at Annapolis, first in his class, in 1861. He was on the *Patapsco* when she was destroyed by a torpedo in Charleston harbor, 1865. He was made lieutenant-commander in 1866 and commander in 1874. He served six years as instructor at Annapolis and successively commanded the *Swatara*, *Iowa* and *San Francisco.* On the outbreak of the war with Spain he was appointed acting rear-admiral, March 26, 1898, and placed in command of the North-Atlantic squadron operating against Spain in Cuban waters. When the Spanish fleet under Cervera took refuge in the harbor of Santiago de Cuba, Sampson established a close blockade of that port, resulting in the destruction of the Spanish fleet when it attempted to escape from the harbor, July 3, 1898. At the close of the war he was made rear-admiral. He died on May 6, 1902.

WILLIAM T. SAMPSON

Sam'son "judged Israel twenty years." He was a Danite and a native of Zorah. At his birth he became a Nazarite, and in accordance with this vow his head remained unshorn and his lips never knew the taste of wine. The account of his marvelous feats of strength and his fall through his love for Delilah, a Philistine woman, forms one of the most interesting of Bible stories.

Sam'uel, the last of the judges, the first of the prophets and, next to Moses, the greatest man in the early history of Israel as a nation. He was an Ephraimite; and, set apart by his mother for the priesthood, he became a temple-attendant under Eli, the high priest, at Shiloh. While but a child he foretold the downfall of Eli and his house. Twenty years after his master's death he gathered the people at Mizpah, routed the Philistines, and governed the nation for twenty years. On the people's wishing for a king Samuel reluctantly anointed Saul and afterwards David as kings of Israel.

Samurai (*să'moo̅-rī*), the military class in the feudal days of Japan, were retainers of the *daimios* or nobles. Originally it would seem that the term was restricted to the guards of the imperial palace; but it became so generalized as to include all whose profession was war. The *samurai* had a great reputation for courage, daring and feats of arms. Their power began to wane after the abolition of the feudal system in 1871, which was the turning-point of the Japanese civilization. Their name was changed in 1878 to the more peaceful title of *shizoki.* The last stand of the conservative *samurai* led to the civil war of 1877, which resulted in their defeat and the change of name already mentioned. Many of them had loyally accepted the changes in their ancient standing, keenly as these changes were felt.

San An'gelo, Tex., county-seat of Tom Green County, is on Concho River. Livestock and agricultural interests are com-

bined in the surrounding region. It has an altitude of 1,900 feet and an abundant water-supply, being near the confluence of five rivers. Among its industries are oil-mill, brick-works, cotton-gins, lumber-yards, shops and general offices, for Texas, of the Kansas City, Midland and Orient Railroad. The city has an excellent system of public schools, a Roman Catholic and private academy, business college, several churches and good municipal buildings. San Angelo has all the adjuncts of an up-to-date city, the services of two railroads and a population of 10,321.

San Anto'nio, Tex., a leading city, county-seat of Bexar County, is on San Antonio River. It has a large trade in horses, mules, wool, hides and grain, and has flour-mills, breweries, tanneries, machine-shops, foundries, binderies, cotton-presses and oil-mills. Among the important buildings are San Fernando Cathedral, commenced in 1749, St. Mark's Cathedral, Menger Hotel and the city-hall. San Antonio has a fine public-school system, with 21 buildings and 150 teachers, colored teachers being employed for colored children. Its broad plazas are overarched by fine old trees, and Brackenridge Park, near the head-springs of San Antonio River, contains 200 acres, is kept in its natural state and maintains a rare collection of wild animals. In the Mexican quarters of Laredito and Chihuahua may be seen Spanish manners and customs, markets, shops, cafés and churches. In San Antonio, as elsewhere in Texas, many Germans have settled, and have greatly helped to build up the city. Except during the war, San Antonio has been the Texan headquarters of the United States army since 1848, and the quartermaster's depot covers eight acres, the arsenal 20. Fort Alamo, just across the river, was the scene of the massacre by Santa Anna of the garrison of 188 men, including Crockett and Bowie, in 1836. The place was founded by the Spaniards in 1714, who built a fort, and four years later some monks began the mission of the Alamo. Population 96,614.

San Ber'nardi'no, Cal., county-seat of San Bernardino County, was settled by Mormons in 1851. It is a summer and winter health-resort, because of its uniform climate. The surrounding country is a rich agricultural and mining section. San Bernardino's leading industries are grain-elevators, fruit-crate factories, lumber-mills and the Santa Fé railroad-shops; while it also is an important shipping-point for fruit, grain and lumber. The city has excellent public and parochial schools, a business college, an academy, an orphan asylum and Southern California Hospital for the Insane. It has electric-car service, two railroads and modern improvements. Population, 18,000.

San Diego (*dē-ā'gō*), **Cal.,** county-seat of San Diego County, the main port of southern California, stands on the beautiful bay of the same name, 125 miles southeast of Los Angeles. The bay, ten miles long, forms a good and very busy harbor. The climate is remarkably genial, and thousands of tourists come here and to Coronado Beach, a suburb across the bay, whose hotel cost $1,200,000. San Diego is the oldest city in California, and Father Junipero's Jesuit mission of 1768 is still preserved and used. A few miles back, at the mouth of a cañon, stands the famous Sweetwater dam, one of the largest in the world, with a curving wall of masonry 90 feet high and 46 feet through at the base. A large trade in wool, nuts, fruit, honey and other products of the country is carried on. San Diego has carriage and wagon works, flour and planing mills and machine-shops. It has a splendid system of public and parochial schools and other educational institutions, and is served by four railroads. A monument to Richard A. Proctor (*q. v.*) was set up near San Diego in 1891. Population, 80,000.

San Domingo. See HAITI and SANTO DOMINGO.

San Francis'co, Cal., the chief city of California and the Pacific coast, stands on a peninsula between the sea and the bay of San Francisco. The bay stretches north and south 47 miles, with a width of six to ten miles. Joining San Francisco Bay on the north are San Pablo Bay, 10 miles long, in which are Mare Island and the United States navy-yard, and Suisun Bay, eight miles long, into which fall the San Joaquin and Sacramento Rivers. The entrance to San Francisco Bay is the famous Golden Gate, a strait a mile and a quarter wide at the narrowest point. The shores are rocky cliffs, in some places nearly 2,000 feet high. The bay is a large factor in making San Francisco's site of such business importance. In the city are three islands, Goat or Yerba Buena, Alcatraz and Angel.

Two hills within the city rise several hundred feet. San Francisco has many large and fine buildings of marble, granite, terra-cotta, iron and brick; yet, in spite of many bad fires, it still, because of its all year 'round climate, has many residences of wood. San Francisco has six large parks and many small ones, all of which are beautiful and attractive. Like Central Park in New York, Golden Gate Park has been reclaimed from a waste tract, in this case of sand-dunes. The park runs along the seashore for about one mile and covers 1,014 acres. At Point Lobos are Cliff House, Seal Rocks and Sutro Heights, which are popular resorts in the summer. Sutro Park is one of the finest private parks in the United States, and is open to the public every day. Sutro Baths, near the Cliff House, are a very extensive bathing-establishment,

500 feet long, 250 wide, and holding 1,804,962 gallons. Ocean-water is conducted into immense tanks and warmed for use. The United States military reservation, known as the Presidio, is in the northeast of the city, and contains 1,500 acres. San Francisco's public buildings, hotels, theaters and business blocks are costly and magnificent. New buildings, eight to eighteen stories high have replaced those which were destroyed in the fire of 1906. The public schools are maintained at an annual cost of $1,550,917. At San Francisco are the schools of dentistry, pharmacy, law and medicine of the University of California. Other schools are Cooper Medical College, Hahnemann Medical College, the School of Mechanic Arts founded

by James Lick, the California Academy of Sciences, also endowed by Mr. Lick, the Jesuit College, and Cogswell Polytechnic College. The public library has over 100,000 volumes; other libraries are the Mercantile, Mechanics', Odd Fellows' and legal libraries.

Cable-roads were first used in San Francisco, and were invented as the easiest method of transit over its steep and hilly streets; but there are numerous lines of electric railway. Water is furnished by a private company; 30,000,000 gallons are brought daily from creeks and reservoirs 20 miles distant. San Francisco has the largest land-locked harbor in the world and hundreds of steamers run out of it to Hawaii, the Philippines, Alaska, Australia, China, Japan and Central and South America. It is the center and supply point for a big coast-wise trade extending as far north as Sitka, and as far south as the Panama. San Francisco is the greatest receiving port for cereals on the coast. In the latest year of record all imports and exports amounted to $91,250,000. Some 42,000 workmen are employed in the city's mills and factories. The leading industries are refining sugar and molasses; slaughtering and meat-packing, fruit and vegetable canning, iron-works. Among the other industries of the city are the manufacture of boots, shoes, gloves, saddlery, grain-sacks and pastry products. Much ship-building is done, smelters operated and gun-powder and dynamite extensively manufactured, the plants of the last two industries being located across the bay from the city. The great Panama Pacific Exposition, fittingly emphasized the vast importance of the Panama Canal (*q. v.*) to San Francisco's commerce. Newspapers are published in nearly every language; 10,000 Chinese live in their quarter; Mexicans, Maltese and Greeks elbow the Europeans more common to others of our cities.

The mission of San Francisco de Asis, often called the Mission Dolores, was founded in 1776 by Spanish Franciscan monks. This mission became wealthy and in 1825 controlled 1,800 Indians. A few years after it was turned over to the civil officers, in 1834, nothing was left of it but the adobe buildings. In its place grew up the village of Yerba Buena, the first house of which was built in 1835. The town was taken by an American man-of-war in 1846, and the next year its name was changed to San Francisco. The discovery of gold in 1848 made it a city at one leap. In the spring of 1849 its population was 2,000, at the end of that year it was 20,000. Five great fires in 1849-51, which swept away the wooden houses thickly crowded together, did not stop the growth in the slightest. In 1851 and 1856, because of bad government, the people organized a vigilance-committee and hanged a number of criminals. On April 18, 1906, San Francisco suffered a severe earthquake shock, followed by a disastrous conflagration, which lasted for three days. Gas and water mains were broken by the upheaval. Soon fires broke out at various points, and, the water-supply being cut off, the fire-department was helpless. For three days the city was swept with fire, until the greater portion, including the entire business section and chief residence districts, 453 squares, was left a mass of ruins. The loss of life was estimated at 12, and the property loss at more than $350,000,000. A wave of sympathy swept over the world, and relief in money, food and clothing was poured into the stricken city, until the contributions amounted to $13,500,000. San Francisco's courage and enterprise in the face of the disaster were a marvel to the world. The work of rebuilding was taken up with such promptness and energy that in four months work was under way on buildings valued at more than $50,000,000, and a new and better built city has now replaced the one destroyed. Population, 551,222.

San Jacin'to, Battle of, the last battle of the Texan war for independence, took place on April 21, 1836, near San Jacinto, Tex. General Santa Anna, in command of the Mexican force of 2,000, was attempting to

cut off the retreat of the Texans, and came up with them at the mouth of the river. Gen. Sam Houston ordered his small force of 783 men to charge, which they did to the shout of "Remember the Alamo!" (See ALAMO.) After fighting an hour and losing 630 men, the Mexicans surrendered. This decisive battle ended the war.

San José (*hō-sā'*), **Cal.**, county-seat of Santa Clara County, is on Guadalupe River, 50 miles southeast of San Francisco. Besides a fine courthouse and a city-hall, it contains the state normal school, a Roman Catholic college for girls, St. Joseph's College for boys (R. C.), University of the Pacific (M. E.) and others. There are 32 churches, several charitable institutions and a public library. Near by is the famous Lick observatory. There are four parks, and the city is noted for its gardens and fruit. It is a center for fruit-canning and wine-manufacture, besides which there are flour, woolen and other mills. Population, 35,000.

San Jose, the capital since 1823 of Costa Rica (*q. v.*), stands in a rich plain, 3,711 feet above the sea. There are many squares and two large parks. The notable buildings are the presidential and national palaces and that of justice, the cathedral, the bishop's palace, the old university buildings, two colleges and the covered market. The chief factory is the government distillery. A railroad joins the capital to Limon, the Atlantic port. Population 29,660.

San Luis Potosi (*loo-es-po'tose'*), capital of the Mexican state of the same name, stands on the edge of a table-land, 7,400 feet above the sea, 362 miles northwest of Mexico City. It is well-built, and contains a fine cathedral, a seminary, railroad workshops, a cotton-factory, and very large smelting works. There are silver mines near by. The city was founded in 1586, and in 1863 was the seat of Juarez's government. Population of the capital 82,946; of the state 624,748; the area of this being 25,316 square miles.

San Marino (*mȧ-rē'nō*), the smallest independent state in Europe and a republic, lies among the Apennines. It covers but 38 square miles, and contains some villages besides the town of San Marino. The town, which is built on a mountain crag, can be reached only by one road. Farming and cattle-breeding are the main occupations. It claims to be Europe's oldest state. Its independence was recognized by the pope in 1631, when the duchy of Urbino, a part of which it had been since the 13th century, was annexed to the papal states. It is governed by a grand council, the members of which are chosen for life, one third of whom are nobles. Two captains-general are chosen, each holding office for six months. Population 10,489.

San Salvador (*sȧl'vȧ-dōr'*), **the capital of** the republic of Salvador, is built at the foot of the extinct volcano of San Salvador (8,360 feet). The houses are mostly of one story, with thick walls, on account of earthquakes. The government buildings are handsome, and a fine cathedral is not yet finished. The city was founded in 1528. In 1854 it was a fine, well-built city, with a population of over 25,000, but on the night of April 16 it was wholly destroyed by an earthquake. Violent shocks of earthquake have been felt in 1873, 1879 and 1891. Population 59,540. See SALVADOR.

Sand, a term loosely applied to incoherent mineral matter occurring in particles smaller than pebbles and larger than particles of mud or dust. If the mineral matter is fine enough to become mud when wet, it would hardly be called sand. Between clay, the particles of which are very small, and sand there is no sharp line of demarcation. The one grades into the other. The same is true of sand and gravel. Sand usually consists chiefly of quartz, but it generally contains other mineral matter in small quantities, and sometimes is largely made of other minerals. Grains of sand are usually thought to be round, though this is rarely the case. They, however, often are roundish. As it occurs in nature, quartz-sand is made of partly rounded bits of quartz-crystals. These crystals originally occurred in igneous rock, and by the decay of the other minerals of the rock the quartz-crystals were set free. They were then brought together in valleys and along shores by the wash of rain, streams and waves. The purest varieties of quartz-sand are used for the manufacture of glass Sand is extensively used with lime for mortar, cements etc When cemented by natural processes, sand becomes sandstone.

Sand-Dol'lar, the name given to a flattened sea-urchin, very common on sandy shores. The soft parts are inclosed in a rounded, flattened disc, made of plates of carbonate of lime nicely fitted together. When living, the discs are covered with short spines. They are dark-yellow or whitish if bleached in the sun. There are five rows of plates with minute holes for the tube-feet as in other sea-urchins, and five rows without holes. In certain forms the disc is completely perforated by a number of orifices of a key-hole pattern. See SEA-URCHIN.

SAND-DOLLAR

Sand, George, the assumed name of Armandine Lucile Aurore Dupin, was born

at Paris, July 5, 1804. She was educated at a convent in Paris, and at 18 married M. Dudevant. After nine years of married life at Nohant she separated from her husband and went to Paris to make her living by writing. Her life was spent among authors and literary people generally, her most intimate friends being Alfred de Musset (*q. v.*), Chopin, Lamennais and Michel. After 20 years of this life she settled on her estate of Nohant in Berri, dividing her time between writing, at which she was very industrious, and showing hospitality to almost all French and many foreign men of letters of eminence. George Sand wrote an enormous number of novels. Among the best are *Consuelo*, *Mauprat*, *Little Fadette* and *The Marquis of Villemer*. Her plays did not gain the extraordinary popularity of her novels. Her *History of My Life* is interesting, but is mostly made up of her fancies and thoughts. George Sand died on June 7, 1876. See *Life* by Miss Bertha Thomas, in the Eminent Women Series.

San'dalwood, the wood of *Santalum album*, a small genus of trees and shrubs from the East Indies, Australia and the Pacific islands. The wood is white or yellowish and noted for its extreme fragrance. It is costly, and is employed for fans, boxes and other small ornamental articles, these usually being intricately carved.

Sand'blast. See GLASS.

San'derling, a bird of the snipe family, which is widely scattered, breeding in Arctic regions and ranging from Iceland to Patagonia. It is about eight inches long and very fat. The winter plumage is ash-gray; the under parts are all white; and in summer the upper feathers are reddish with black markings. They are very common along our beaches, always seen in flocks, always zealously hunting for food. They appear more wary than the sandpiper, utter a shrill cry when startled, and a large company moves as one bird.

Sand'piper, a name commonly applied to several shore-birds belonging to the snipe

SANDPIPER

family. These birds run over the sand uttering a piping note, which doubtless gave them their name. They are small, active birds, running along the shore and feeding on the small forms of life cast up by the waves. Many of them are simply migrants in most parts of the United States. The best-known form nesting in the United States is the spotted sandpiper. This is a true snipe, about seven and one half inches long, with upper parts brownish, gray, and black, the under parts white, spotted with black. It is also called tip-up and pee-wit, being named from its teetering habit and its sharp, sweet *peet-weet, weet-weet*. It is a familiar summer resident, widely distributed, found on high upland as well as wet meadow. The bit of a bird yields only a morsel of food, but many are shot annually by the pot-hunter. Usually there are two broods a season. The nest is made in a depression in the ground, and has a lining of grass; the eggs are buff, speckled with brown. The semipalmated sandpiper or sand-peep is about an inch shorter than the form just described. It is similar in coloring, but has no spots on the breast. They are abundant during migrations in flocks, which sometimes number several hundred. See SNIPE.

Sand'stone is a rock formed of compacted sand. The grains are generally quartz, though other minerals are often mixed with this; they are colorless or of a dull-white, yellow, brown, red or green. The grains vary in size, forming a fine or coarse grained stone. Sandstone, especially when of handsome color, is much used in building.

Sandus'ky, O., stands on the southern shore of Sandusky Bay, an arm of Lake Erie, 56 miles (by water) west of Cleveland. The bay, 15 miles long and five wide, forms a good harbor. The city is built on a bed of limestone, on a site rising gradually from the shore. Its business as a port is large, its wharves shipping quantities of fish, lime, limestone, lumber, salt, coal, ice, wool, wheat, flour and Ohio wine. There also are machine and car works, edge-tool, wheel, window-glass, furniture, and woodwork factories, wagon and carriage works, corrugated paper and underwear factories, electric-dynamo, steam-turbine, structural iron and cement works. Sandusky is an important import and export point for Canadian trade. It has good municipal buildings, many churches, fine public and parochial schools and a public library. Here is the State Soldiers' and Sailors' Home, which has 37 buildings constructed of blue limestone and accommodates 1,600 persons The neighboring islands are a favorite summer resort. Population 19,989.

Sand'wich Islands. See HAWAIIAN ISLANDS.

San'dy Hook, a narrow, sandy peninsula of New Jersey, between the Atlantic and Sandy Hook Bay, 16 miles south of New York. It is about six miles long, and

reaches northward toward the Lower Bay of New York. Near the north point are a fort, a life-saving station and Sandy Hook lighthouse, with a lantern 90 feet high. The voyage across the Atlantic is considered to begin at Sandy Hook.

Sangir (*săng-gēr'*) **Islands,** 50 mountainous and volcanic islands between the Philippines and Celebes, covering 323 square miles. The largest, Great Sangir, on which a fourth of the people live, contains the volcano Abu, the eruption of which in 1856 cost more than 6,000 lives. The people, who number 50,000, are Malays, and are ruled by their own chiefs under the protection of the Dutch.

San'hedrim, the supreme national council of the Jews, established under the Maccabees. There were 71 members, and it was presided over by the *Nasi* or prince at whose side stood the *Ab-Beth-Din* or father of the council. The members were priests; elders, by whom were meant heads of families; scribes or doctors of the law; and men of learning. The high priest, if a man of learning, otherwise "he who excels all others in wisdom," was appointed president. This court had power over life and death, regulated admission into the priesthood, and slowly gathered to itself the whole internal government of Palestine. It usually met daily in a hall in one of the temple-courts, though on extraordinary occasions it met at the house of the high priest. After the destruction of Jerusalem the sanhedrim found its way to Babylon. See Schürer's *History of the Jewish People in the Time of Christ.*

San'itary Commis'sion, The, was established by women of the northern states at the beginning of the Civil War, to aid and comfort the soldiers of the Union. Its inspectors endeavored to improve the ventilation, drainage, clothing, cookery etc. in the camps. To it was due the establishment of pavilion-hospitals at the camps and of soldiers' homes at recruiting points; it provided hospital-steamers and cars for sick soldiers, and distributed the supplies given the soldiers by the women of the land. The commission was a board of 25 men; its president was Dr. Henry Bellows of New York. During the war $4,924,481 were received, besides supplies worth $15,000,000.

Sansculotte (*sănz'kû-lŏt'*), that is, "without breeches," was the name given in scorn at the beginning of the French Revolution by the court-party to the democratic party in Paris. The latter adopted the name with pride, and used it as a title to distinguish the "good patriot." The name was given because of the revolutionists giving up knee-breeches and wearing trousers, not because of their roughness of manner or raggedness of dress, as has often been supposed.

San'ta A'na, Cal., a city 30 miles southeast of Los Angeles, is the county-seat of Orange County and the business-center of Santa Ana Valley. This valley is one of California's most fertile sections, producing fruits of every variety, sugar-beets and wheat and having peat-beds nearby. Santa Ana has flour and planing mills, soda-works and a vegetable and fruit cannery. It has excellent public schools, a business college and a library. It has the service of two railroads, waterworks and a population of 15,000.

Santa An'na, Antonio Lopez de, president of Mexico, was born at Jalapa, Feb. 21, 1795. When 15 he entered the Spanish army, and served against his countrymen till 1821 when he joined Iturbide, who made him brigadier-general and governor of Vera Cruz. In 1822 Santa Anna proclaimed a republic and brought about the downfall of Emperor Iturbide. In 1829 he defeated and captured a body of Spanish troops which had landed at Tampico, and in 1832 through intrigue and revolt had himself chosen president. Under Santa Anna the states became mere provinces, while all power was in the hands of the central government. This policy cost Texas in 1836. Santa Anna invaded this province with 6,000 men, and defeated and massacred the Texans with unbroken success, till he was routed and his army and himself taken prisoners by Gen. Sam Houston at San Jacinto (*q. v.*). After eight months' imprisonment he was set free, but his influence at home was not recovered till his gallant defense of Vera Cruz against an attack of the French in 1838. In 1841 a revolution again put him in the president's chair, and in 1845 another revolution sent him into exile at Havana. But in 1846 the war with the United States, which had opened badly with the loss of Palo Alto, Resaca and Monterey, caused the Mexicans to recall Santa Anna and make him president and commander-in-chief. But the loss of the battle of Buena Vista to Taylor and Cerro Gordo to Scott, followed by the certainty of the fall of the capital, induced Santa Anna to leave the city by night, after resigning the presidency. In 1853 he was made president for life, but his harsh rule caused him to be driven from the country two years after. In 1867, after the death of Maximilian, he tried to land in Mexico, was captured, tried and condemned to death, but was pardoned on condition of leaving the country. He died at Mexico City, June 20, 1876.

Santa Bar'bara, Cal., county seat of Santa Barbara County, 104 miles northwest of Los Angeles, on the Santa Barbara Channel. The surrounding country produces fruit, English walnuts, olives, beans, corn, potatoes, etc. Petroleum and valuable medicinal springs are near the city which has a good harbor and

fine railroad connections. Santa Barbara has good public schools and the only State Normal School where teachers are trained in domestic science. The Santa Barbara Mission, the largest and best-preserved of any in California, and the only one in which services have been held continuously since the founding in 1786, is here. Population, 17,000.

Santa Claus, a corruption of the name of St. Nicholas. The term was first used by the Dutch settlers of New York, who kept a San Claus holiday. Santa Claus is held to be the patron saint of the young, and his feast, held on Dec. 6, was celebrated formerly in England and still is in Germany. Now the visit of Santa Claus bearing gifts to the children is transferred to Christmas.

Santa Cruz', Cal., a prosperous city of Santa Clara County, 60 miles south of San Francisco on the Bay of Monterey. It is in a fruit-belt, but also engages in manufacturing. Chief among its productions are powder, soap, boxes, bitumen, leather and lead. The city has excellent public and parochial schools, a business college and a public library. It has the service of two railroads, a fine bathing-beach and good public buildings. Population 11,146.

Santa Fé (*săn'ta-fā'*), **N. M.,** the capital of New Mexico, is among the Rocky Mountains, 6,840 feet above the sea and 1,327 miles southwest of Chicago. The site is a mountain-walled basin, 20 miles from the Rio Grande. Half the people are Mexicans, dwelling in low adobe houses on narrow streets. The plaza has shops on three sides, and on the other the old governor's palace, a long, low, adobe building. The climate is so dry that irrigation is necessary for gardening or farming. When first seen by the Spaniards about 1542, the town was a well-peopled Indian pueblo. It was founded in 1605, and has been the capital since 1640. The Indians captured it, burned the main buildings, and drove out the whites in 1680. The Indians again made an attack in 1837, but were driven off by the Mexican governor, Manuel Armijo. General Kearny occupied it with United States troops in 1846. During the Civil War the Confederates held Santa Fé for a few weeks in the spring of 1862. Santa Fé has three public-school buildings, fine churches, a U. S. Indian school, a deaf and dumb school and the penitentiary. The city has a fine waterworks and electric light system. Its points of interest are many and historical, as the church of San Miguel, the oldest church in the United States, and the governor's palace built in 1598. Population 5,072.

Santa Ro'sa, Cal., county-seat of Sonoma County, about sixty miles northwest of San Francisco. It is in a fertile section, where, in addition to fruit-growing, hops are a crop, and stock-raising and dairying are practiced. The chief industrial establishments are carriage-works, soap-factories, flour-mills, machine-shops, fruit-drying and canning works and a brewery. Santa Rosa is served by the California Northwestern and Southern Pacific railroads. Population 7,817.

Santiago (*săn'tē-ä'gō*), the capital of Chile, stands on a wide and beautiful plain near the western base of the Andes, 1,700 feet above the sea-level and 115 miles southeast of Valparaiso. The town is well-built, but most of the houses are only one story high, owing to earthquakes. The chief square is Plaza Independencia, its sides formed by the government palaces, arcades, cathedral, archbishop's palace and a handsome hotel. On the site of the Jesuit Church, which was burned down in 1853, is a marble and bronze monument in memory of the 2,000 worshipers, mostly women, who perished in the fire. The government buildings include the capitol, mint, president's dwelling, prison, two hospitals and a deaf and dumb asylum. The Alameda, with four rows of fine poplars, runs the whole length of the city and is adorned with many statues. Facing it are the State University with 2,500 and the National Institute with 2,148 students. There are other special schools, besides a national library of 116,300 volumes, botanical and zoological gardens, exposition buildings, theaters and club-houses. Santiago is surrounded by pretty suburbs dotted with villas and gardens bright with flowers. There are considerable trade and a busy stock-exchange. Cloth, ship-biscuits, beer, ice etc. are manufactured. Santiago was founded by Pedro de Valdivia in 1541. Population 332,720. See CHILE.

Santiago de Cuba (*săn'tē-ä'gō dā kōō'bā*), a southeastern province of Cuba; also a fortified city, seaport and former capital of the island, situated near the mouth of River Santiago, fronting a harbor four miles long on the southern coast. American administration of the city and province was in July, 1898, intrusted to Maj.-Gen. Leonard Wood, and was ably conducted. He effected many reforms and did much to improve sanitary conditions and secure good and orderly government. He also established public schools, instituted courts of law, and constructed roads inland and along the coast. The region is rich in metals, including iron, copper and manganese, and in forests of cabinet-woods, as mahogany and cedar, besides dye-woods and other elements of wealth. Its chief products, however, are sugar and tobacco; while in the city there are many cigar factories, foundries and saw-mills.

On the outbreak of the Spanish-American war the Spanish fleet under Admiral Cervera was in West Indian waters; on May 20, 1898, this squadron entered the harbor of Santiago and was at once blockaded by a United States fleet, commanded by Admiral

Sampson. To "bottle up" the Spanish vessels in the harbor, Lieut. R. P. Hobson took the *Merrimac* into the narrow channel between the Morro forts, at the exit of the harbor, and there sank her with torpedoes. This gallant deed was effected on the night of June 3, and was rendered all the more hazardous, not only by the blowing up of the ship, but by the fire drawn upon her from the enemy. Hobson and his volunteer crew were all made prisoners, two only of their number having been wounded. A few days after this a force of United States marines landed at Caimanera and formed Camp McCalla; General Shafter landed a division at Baiquiri; and General Wheeler another at Siboney, the landing being covered by the guns of the fleet. These forces, proceeding toward Santiago, were met near Sevilla, six miles inland from Baiquiri, by a Spanish force, when the battle of Las Guasimas was fought. Following upon this (July 1st), occurred the two bloody engagements at San Juan and El Caney, in which the Spanish forces were defeated and driven within the fortifications of Santiago. Then came the fatal dash of Cervera's squadron out of the harbor, which Hobson had not succeeded in closing, and its speedy annihilation on July 3. Operations against the city were pressed by General Shafter, resulting in the surrender, July 14, of the city and province together with over 20,000 Spanish troops under General Toral. Population of the town about 50,000. See SPANISH-AMERICAN WAR and CUBA

San'to Domin'go, The Republic of, was founded in 1844. The present president is Ramon Caceres, the holder of the presidency being elected by an electoral college for four years. The legislative power is vested in a national congress composed of 24 deputies. The area of the republic is estimated at 18 045 square miles with a population of about 610,000, which, unlike that of Haiti, is chiefly composed of a mixed race of the original Spanish inhabitants, the aborigines, mulattoes and negroes, and a considerable number of whites or of inhabitants of European descent, who speak Spanish and, in the towns, both English and French. The capital, at the mouth of the Ozama, is Santo Domingo. Santiago is estimated to have 12,000 inhabitants; Macoris 5,000; and Puerto Plata, the chief port, about 6,000. The republic has about 300 public schools, with some 10,000 pupils. The country is rich in timber, as also in minerals. Its chief exports, however, are sugar, cocoa, bananas, coffee and leaf-tobacco; rice is also grown. The imports in 1910 were a little over six million dollars in value; while the exports amounted to $10,849,000. There are about 150 miles of railway and 430 of telegraph line. See HAITI. Consult Hazard's *Santo Domingo* and Kimball's *Life in Santo Domingo.*

Santo Domingo, capital of the Dominican Republic, is on the southern coast of Haiti. It was founded by Columbus as early as 1494. The main buildings are the Gothic cathedral, where the ashes of Columbus found rest from 1536 to 1796, the hospital, arsenal and government buildings. A wall surrounds the town, and forts and batteries defend the harbor. Population 18,626.

Santos-Dumont (*sän-tōs-dü'môn'*), **Alberto,** is a balloonist and inventor born in Brazil in 1873, who learned practical mechanics on his father's private railroad at the same time that he attended the school of mines at Minas. He was a student and graduate of the University of Rio Janeiro; and in France entered the aëronautic school. In 1897 Santos-Dumont made no less than 20 balloon-ascensions. In 1901 he caused a dirigible balloon to be made of a cylindrical shape and on October 19 won the Deutsch prize by steering a balloon around the Eiffel Tower (*q. v.*) and back in half an hour. Santos-Dumont has made experiments not only with airships but with automobiles; but he has chosen to forego the rights of patent to all his inventions, which are freely presented to those who have skill and courage to use them. See AËRONAUTICS in which the whole subject of flight by birds and men is explained.

São Francisco (*sän frän-sēsh'kŏŏ*), a large river of Brazil, rises in the southwest part of Minas Geraes, in its lower course separates Bahia and Sergipe from Pernambuco and Alagoas, and after 1,800 miles falls into the Atlantic. It is navigable as far as the mouth of the Paraopeba, except at three points, one of which is the falls of Paulo Affonso (275 feet), around which traffic is carried by rail.

São San Paulo (*soun pou'lŏŏ*), capital of the Brazilian state of the same name, stands on a wide plain, four miles from Rio Tiete and 310 southwest of Rio de Janeiro. There are a handsome public garden and beautiful suburbs. The main buildings are the government palace, formerly a Jesuit College, the bishop's palace and a celebrated law-school. São Paulo is the headquarters of the coffee trade, and four railroads join it to the coffee-districts. There are a number of factories. Population 400,000. The state covers 112,307 square miles and has 2,279,608 inhabitants.

Sap, Ascent of. See WATER, ASCENT OF.

Sapphire (*săf'ir*), the most precious of gems except the diamond and ruby, is, like the latter, a variety of corundum. The name is commonly given to the beautiful blue variety of corundum, but stones of other shades, as colorless or pink, sometimes receive the name. Purplish or greenish colors are undesirable, while clouds, milky spots, flakes or stripes show flaws. It is found crystallized, usually in six-sided prisms, ending in six-sided pyramids. It is sometimes found imbedded in gneiss, but

more often in clay soils. The finest sapphires are found in Ceylon; Kashmir and Burma also produce beautiful specimens; and sapphires are found in the United States (particularly in Montana) and in Victoria and New South Wales. The value depends on quality rather than size and does not increase with the size, as does that of the ruby. A sapphire of 165 carats was sold in 1867 for $40,000. In early times a dark-hued or indigo sapphire was called a male sapphire, a pale blue one a female sapphire.

Sappho (*săf'ō*), one of the great poets of the world, was born on the island of Lesbos in Greece. She was only six when she lost her father, and must have lived about the end of the 7th century B. C., as she flourished at the same time as Alcæus and Stesichorus. But little is known of her life, except that she had a daughter and was acquainted with Alcæus. It is said that she fled from Mitylene to Sicily for refuge about 596, but a few years later came back to Mitylene, where she was the center of a group of girls with a passion for poetry. But two of her odes, one to Aphrodite, with a number of short fragments have survived the wear and tear of centuries, but they are enough to assure her genius. For sincerity, deep feeling, passion and exquisite grace her lyrics stand alone. There is a story that she fell in love with a beautiful youth, and, because he did not return her love, plunged from a precipice, called the Leucadian rock, into the sea.

Saprophytes (*săp'rō-fīts*), plants which are not able to make their own food and do not attack living plants or animals, but obtain their food from decaying bodies or organic products. These plants are not able to make their own food, because they do not contain chlorophyll. They attack dead bodies or body products, and sooner or later all organic matter is attacked and decomposed by them. Were it not for them it is said that "the whole surface of the earth would be covered with a thick deposit of the animal and plant remains of the past thousands of years." Saprophytes are mostly fungi, but some of the higher plants also adopt this method of obtaining food. See FUNGI.

Sap-Suck'er, a name loosely applied to several small black and white woodpeckers and to the white-bellied nuthatch. The only true sap-sucker is the yellow-bellied woodpecker, a permanent resident in some parts of the United States and a winter resident in other parts. These birds perforate the bark to the sapwood, and have done extensive damage to orchards and shade-trees in the west. But they also render service in that they are great insect-eaters; destroying countless numbers of ants, wasps, beetles, bugs and grasshoppers and eating more flies than any other woodpecker. The bird is about one fifth smaller than the robin; its upper part is black, white and yellowish; breast black and the rest of the under-part pale yellow; throat and crown a bright red. It is a boisterous member of the woodpecker family, its note gay and rollicking, its woodpecking tattoo a spirited performance. Both the male and the female work in making the nest, excavating a deep hole, where five or seven white eggs are well-concealed. Both birds share in hatching.

Sap'wood'. As the trunks of trees increase in diameter each year, new layers of wood are laid down. The ascending sap moves through the newer wood, gradually abandoning the older. This newer wood, therefore, is known as sapwood, in distinction from the abandoned wood, known as the heart-wood (*q. v.*).

Saracen Architecture. There are no examples of purely Arabic architecture, except a few indistinct ruins of cities and streets excavated out of rocks. The Arabs were wanderers, not artists, and so, whether they built at home or in the countries they invaded, Persian and Byzantine workmen were the usual builders secured by the caliphs or rulers. Omar the second caliph (644 A. D.) introduced the minaret, a slender tower from which a priest should call the people to prayer. All of the Arab tribes in Asia, as well as the Moors of North Africa and Spain, are classed under the term Saracen, and it is to this race that Europeans owe some of their best designs used in architecture and the practical arts. Interesting examples of Saracenic architecture are in Cairo, Damascus, Cordova, Seville and Granada. The Saracens are lovers of geometry. Their Mohammedan Bible, the Koran, is written in Cufic, the most beautiful script known. Therefore the artists invented a type of design known as arabesque, which is a combination of scrolls, lines and twists, with which they stamped the upper portion of their plaster-walls, mingled with texts from the Koran. This, combined with a stalactite or hanging ceiling, made a beautiful and refined decoration. The lower portions were faced with richly colored tiles dipped in a glaze (coat of glass), an art learned from the Persians, who taught soft pottery. Wonderful tiles in blues and greens, with copper glaze, may be seen on the tomb of Mahomet (A. D. 707) the great mosque at Cordova (A. D. 756) and the Moorish buildings of Granada. There, also, one may examine a vase about four feet high, of graceful proportions, which is decorated with arabesque and covered with a brilliant gold glaze. This ware is known as Hispano-Moresque. The finest example that is perfect is owned in Sicily. The Saracens introduced tapestry or carpet-weaving into Spain about the 12th century and later

established looms in Almeria and Malaga, where the costliest stuffs were woven. These included the material manufactured for the nobility, called *tiraz*, with the name of the wearer to be woven in the cloth A banner now in Burgos shows a crimson stuff woven and embroidered in gold threads. Strictly Moorish architecture is known by the absence of domes and decoration upon the outside of buildings and by the presence of isolated towers and elaborate adornment of interiors. The most noted of their royal palaces is the Alhambra (*q. v.*) Consult Gwilt's *Encyclopedia of Architecture;* Lübke's *History of Art;* and De Forest's *History of Art*. See ARCHITECTURE and FINE ARTS.

Saracens (*săr'â-sĕnz*), the name formerly given by western writers to the Mohammedans of Syria and Palestine, the Arabs generally or the Arab-Berber races of North Africa, who conquered Spain and Sicily and invaded France. Later it was used to mean all nations against which crusades were preached, and was thus applied to the Seljuks of Iconium, the Turks, the Gypsies and even the pagan Prussians. Whether the word comes from an Arab word meaning to steal, from another meaning desert, from a Hebrew word meaning poor or from an Arab word meaning eastern people has been disputed, but the last guess is the most likely. See ARABIA, CRUSADES, MOORS.

Saragossa (*să'râ-gŏs'â*) or **Zaragoza**, a city of Spain, formerly capital of the kingdom of Aragon, stands on the Ebro, 212 miles northeast of Madrid. A seven-arched bridge, built in 1437, crosses the Ebro within the city. The low, brick houses and narrow, winding streets contrast strangely with the many tall and slender towers and spires. There are two cathedrals, one a Gothic building of the 13th century. The citadel of Aljaferia once was the palace of the kings of Aragon and later the headquarters of the Inquisition. The university, founded in 1474, has 47 professors, 800 students and a library of 18,000 volumes. The leaning tower, *Torre Nueva*, built in 1504, has been declared unsafe and ordered taken down. Cloth, silk and leather are among the town's manufactures. The name is a corruption of *Cæ sarea Augusta*, which it was called in 25 B. C. It was an important Roman town, and was one of the first Spanish cities to accept Christianity. Saragossa was taken by the Goths in the 5th and by the Moors in the 8th century, and recaptured in 1118 by Alphonso of Aragon, after a five years' siege, during which most of the people died of famine. It was twice besieged by the French in 1808, 60,000 people perishing in its defense. It was at this siege that the famous Maid of Saragossa, whose exploit has been sung by Byron and Southey, fought by the side of her artilleryman lover. Population 105,788; of the province 448,198.

Saratoff (*sa-ra'tof*) or **Saratov**, a city of Russia on the Volga, 500 miles southeast of Moscow, stands on terraces rising from the river. There are nearly 30 churches, two cathedrals and a museum containing a fine art-gallery and library. Brandy, liquors, oil, flour and tobacco are manufactured. There is also a large trade. Saratoff was pillaged in 1774 by a Cossack pretender to the czardom. Population 197,822.

Saratoga (*săr'â-tō'gâ*) **Springs, N. Y.**, one of the chief watering-places in the United States, is 38 miles north of Albany. It has about 50 mineral springs, whose waters are bottled and exported. There is a large number of huge hotels, some having rooms for over 1,000 guests, and on special occasion they have accommodated 40,000. Because of its spacious hotels and convention-halls it is a favorite place for conventions. It has 18 churches, several charitable institutions, good public and parochial schools, a high-school and Temple Grove Seminary, each of these containing a library, and also the libraries of McMillan Reading Circle and the Athenæum. There is a race-track, and regattas are held on Saratoga Lake, four miles away. Population 12,693.

Saratoga, Battle of, was fought on Oct. 7, 1777, near Saratoga Springs, N. Y. The British under Burgoyne and the Americans under Gates had faced each other since Sept. 14. Burgoyne advanced against the Americans, who charged in turn, headed by Arnold, who had rushed without orders to head off the attacking column and had assumed command. After a stubborn fight the British abandoned their guns and retreated to their camp, followed by the Continentals who charged and carried a part of the camp, when darkness ended the battle. On the 9th Burgoyne retreated to Saratoga, where he was hemmed in by Gates and forced to surrender on the 17th. At the time of the surrender the American force numbered 10,817; the British surrendered 5,804 men, 4,647 muskets and 42 guns. This victory in some respects was the most decisive one of the war. Twelve miles east of Saratoga Springs a handsome obelisk, 155 feet high, on a bluff 350 feet above the Hudson, overlooks the scene of this surrender, which it commemorates.

Sardanapalus (*săr'dâ-nâ-pā'lŭs*), according to Greek tradition, a king of Assyria, whose reign was ended by a revolt. The rebels were defeated several times, but at last shut up Sardanapalus in his capital of Nineveh, and besieged him for two years. When the city could hold out no longer, the monarch gathered all his vast treasures, and, setting them on fire, leaped with his wives into the flames. It is not certain what.

if any, real king of Assyria is referred to under this Greek name He perhaps was Asurbanipal, who began his reign in 668 B. C.

Sar'dine, a small fish of the herring family. It received its name from being taken abundantly off the coast of Sardinia. The true sardine is a tunny. They are abundant in the Mediterranean and off the coasts of Spain and Portugal. They are salted, boiled in oil and packed in flat, tin boxes containing oil. In this form they are exported as a delicacy to all countries. The supply of true sardines is now considerably reduced and is not sufficient to supply the market. As a result, sprats, pilchards and other small herring have been preserved in oil and sold under the name of sardines.

Sardinia (*sär-dĭn'ĭ-â*), an island of Italy, after Sicily the largest in the Mediterranean, is 135 miles southwest of the Tiber and is south of Corsica, from which it is separated by the Strait of Bonifacio, seven and one half miles wide. In the south is the Gulf of Cagliari, a deep, wide bay, and in the north the Gulf of Porto Torres. The island is 170 miles long and 75 wide, and covers 9,306 square miles. The country is generally mountainous, the highest peak being Gennargentu (6,233 feet). The grotto of Neptune on the west coast is one of the finest in Europe. Sardinia in early times was a granary of Rome, and was renowned for its mines. It has a rich soil, valuable mines, large forests and important fisheries, but these resources are only partially used. The main produce is wheat, barley, beans, potatoes, wine, olive-oil, oranges, lemons, tobacco and flax. Large numbers of horses, cattle, sheep, swine and goats are bred. Lead and zinc are the chief metals mined; granite, marble and clay for pottery are quarried; and convicts manufacture salt from seawater. The fisheries yield tunny, sardines, anchovy and coral. There are a number of good ports — Cagliari (the capital), Porto Torres, Terranova, Tortoli and others. The people mostly are mixed races, Spanish and Italian. Italian is spoken by the educated, but the common language is a mixture of Latin, Italian and Spanish. Eighty-three per cent. of the population cannot read or write; there are universities at Cagliari (founded in 1626, with 254 students to-day), and Sassari (founded in 1677, with 200 students). The vendetta and brigandage, once common, have almost wholly stopped. The first people of Sardinia seem to have been Iberians. These were conquered by the Phœnicians, but little is known of them before the conquest by the Carthaginians in 512 B. C., who ruled tyrannically till displaced by the Romans in the 3d century B. C. After the fall of the Roman empire Sardinia was overrun by Vandal, Goth, Saracen, Byzantine and papal soldiers. After a twenty years' struggle the Pisans and Genoese drove out the Saracens, and in 1299 divided the island between them. Its later masters were the Aragonese, Spaniards and Austrians, and in 1720 it was exchanged for Sicily and, with Savoy and Piedmont became the kingdom of Sardinia under the rule of the house of Savoy. Except for the short time it was annexed to France under Napoleon, this family continued in power. After the French Revolution Sardinia became of importance among the smaller European states and took part in the Crimean War. Victor Emmanuel II became king of united Italy and its later history is Italian. Population 852,934. See C. Edwardes' *Sardinia and the Sardes.*

Sar'dis, the capital of ancient Lydia in Asia Minor, stood at the foot of Mount Tmolus (5,906 feet). Its people were rich. They wove luxurious, woolen stuffs and carpets and carried on a large trade between the highlands and the coast. It, moreover, was the capital of fabulously wealthy Crœsus. Its wealth was tempting; it was destroyed by the Cimmerian Gauls in the 7th century B. C., by the Athenians in the 6th, by Antiochus the Great in 215 B. C. and by Timur in 1402; besides this it was overwhelmed by an earthquake in the reign of Tiberius. Both Xerxes and Cyrus the Great lived here before setting out on their famous expeditions. Sardis lost its trade as Byzantium grew, and now only a small village, called Sart, stands on the ancient site.

Sardonyx (*sär'dŏ-nĭks*), a variety of onyx or stratified chalcedony, exhibiting white layers alternating with those of a red or brown color. It has always been a favorite stone with the cameo-engraver, and hence the stone has been imitated artificially by spurious fabrications. The sardonyx usually is composed of two strata, a thin layer of white chalcedony resting upon a ground of either carnelian or sard; though more rarely it presents three layers — a superficial stratum of red, an intermediate band of white and a base of dark-brown chalcedony. The stone is to be distinguished from jasper, an opaque variety of chalcedony, and from the Mexican onyx, a form of aragonite or carbonate of lime. The sardonyx derives its name from Sardis, reputed to be its original locality.

Sardou (*sär'dōō*), **Victorien,** French dramatist, was born at Paris, Sept. 7, 1831. His first production was a failure, but in 1860 he met with success in *Monsieur Garat* and *Les près Saint-Gervais.* Even better received was his comedy *Les Pattes de Mouche,* as were his numberless dramatic compositions for Madame Bernhardt and others — *Fédora, Théodora, La Tosca, Gismonda.* Other of his notable productions are *Nos Intimes, La Famille Benoîton, Divorçons, Belle-Maman, Pamela, Cléopâtra* and *La Marquise.* In 1899 he wrote a play for Henry Irving on the theme of Robespierre, followed by one on Dante. He died on Nov. 8, 1908.

Sargas'sum, a genus of brown seaweeds whose species are often observed floating in great masses in the large eddies formed by oceanic currents. These regions of comparatively stagnant water covered by sea-weeds are known as Sargasso Seas, the prevailing type being a species of *Sargassum*. See PHÆOPHYCEÆ.

Sar'gent, John Singer, an American painter, was born of American parents in Florence, Italy, in 1856. He was educated in Italy, France and Germany. His early art-training was under Carolus Duran by whom he was chosen to assist in the execution of important government commissions wherein he mastered the secrets of French technique. His chief works are in portrait and genre; among the former *Carolus Duran, Joseph Jefferson, William M. Chase, Homer St. Gaudens, President Roosevelt;* among the latter, *Fishing for Oysters at Cancale* and *Neapolitan Children Bathing*. His most ambitious and original works are the decorations in the Boston Library which include the famous *Frieze of the Prophets*. His portraits reflect clearly even the subtilest traits of individuality. His manner is French, and his treatment superior. His *Dogma of the Redemption*, a portion of the wall-painting in the Boston Library, is deeply devotional and one of the finest Christian paintings of the period. It is divided into an upper and lower panel, which seem to represent Heaven and Earth; in the upper are the three persons of the Trinity enthroned, redeeming the world; in the lower are angels bearing the reeds, nails, the spear and crown of thorns.

Sar'gon. See ASSYRIA.

Sarma'tians, a race who spoke the same language as the Scythians. They were nomads, wild and savage in looks, good horsemen and bowmen, and dressed in leather armor. Their young women went into battle on horseback, a custom which may have caused the Greek stories about the Amazons. They were made of several tribes that roamed the wide plains from the Vistula and the Danube to the Volga and the Caucasus. In the second half of the 4th century B. C. they conquered the Scythians (*q. v.*). Their empire lasted till the 4th century A. D., when it was overthrown by the Goths.

Sar'nia, Can., stands where St. Clair River issues from Lake Huron. The submarine tunnel connecting the railway systems of Ontario with those of Michigan is here. Steamers leave Sarnia twice a week for Duluth. There is ferry-communication with Port Huron (Michigan). The oil-refineries, salt-works and lumber are extensive industries.

Sar'saparil'la is the dried root of the smilax, a native plant of Central America. It is a twining shrub, which grows only where water is plenty. The brownish root is many feet long and about as thick as a goose-quill. A liquid extract is used as a flavoring and a medicine.

Sar'to, Andrea del, a painter of Florence, where he was born in 1487 or 1486. His family name was Vannucchi, but he was nicknamed Del Sarto — the tailor's son — from his father's business. He painted two series of frescos in Florence, the best of the first series being *Nativity of the Virgin* and *Journey of the Three Kings*. He spent a year in Paris at the invitation of Francis I, and was very popular among the French. The most celebrated of his single pictures are the *Last Supper*, the *Madonna with the Harpies* and *Fathers of the Church Disputing*. Del Sarto was a rapid worker, and excelled in accurate drawing. Michael Angelo rated him highly. He died at Florence in 1531. See Crowe and Cavalcaselle's *Painting in Italy*.

Saskatche'wan, a province of the Dominion of Canada lying west of Manitoba and having Alberta on the west, Mackenzie on the north and the United States on the south. It has an area of 251,000 square miles. The province is a vast plain, containing 159,038,720 acres, and the greater portion of its southern two thirds is situated in the great wheat-growing belt. The portion adjoining or lying near to Manitoba possesses much of the characteristics of that province as to soil, topography, climate, rainfall and, consequently, productive adaptabilities. The soil is a friable loam, easily worked and producing excellent crops of wheat, coarse grains and vegetables. The winter climate answers all requirements, both as to degree of cold and as to sufficiency of snowfall, for the production of the No. 1, hard wheat for which Western Canada is now noted. The valleys along Saskatchewan, Qu'Appelle, Assiniboine and Souris Rivers, Pipestone, Long and other creeks, are specially adapted for mixed farming, and the open prairie beyond affords large areas for grazing or grain-growing The region is well-served by the Canadian Pacific Railway. Southwestern Saskatchewan is entered at McLean station, and its first considerable town is Regina, the capital of the province. The land here is a rich, fertile loam, as well to the south as to the north. Several new and important towns have sprung into existence along the "Soo" line, as Halbrite, Weyburn, Yellow Grass, Estevan, Milestone and Rouleau. The cultivation of flax is carried on to a considerable extent. Wheat-raising, however, is the important industry of this district, and the yields are highly satisfactory to the producer. Between Regina and Moose Jaw there is splendid land, and mostly occupied by prosperous farmers. The central portion of the province is almost centrally divided by the main Saskatchewan River, which is altogether within the district, and by its principal branch, the North Saskatchewan — most of the navigable length of which lies within its boundaries. It includes, in the south, a

small proportion of the great plains, and in its general superficial features may be described as a mixed prairie and wooded region, abounding in water and natural hay and well-suited by climate and soil for the raising of wheat, cattle and sheep. As a general thing, the surface is gently undulating prairie. Northern Saskatchewan consists of the eastern half of the late Territory of Athabasca and embraces an area of about 70,000,000 acres, enough for a fine-sized province in itself. As yet it is not opened for settlement because of its inaccessibility and distance from railway systems, the nearest railway station being Prince Albert. The province had a yield of wheat of 112,369,405 bushels in 1913 and of oats 110,210,436 bushels. The mean summer temperature at Regina is 62.7° and in winter is 6.9°. The population is 600,000. Its capital city, Regina, has a population of 45,000, Moose Jaw has 25,000, Prince Albert 12,300 and Saskaloon 27,500.

Saskatchewan (*săs-kăch'ĕ-wŏn*), a large river of Canada, draws its waters from the Rocky Mountains, and is formed by two head-waters called the south and the north branch. The northern branch rises among the glaciers near Mt. Hooker, the southern branch from a group of springs near the same locality but a short distance to the south. The former has a course of 770, the latter of 810, miles before they meet. The river then flows east 282 miles to Lake Winnipeg, from which its waters are carried to Hudson Bay by Nelson River. Including the Nelson, its whole length is 1,514 miles. Steamers run from Lake Winnipeg to Edmonton (700 miles); the Nelson is spoiled for navigation by rapids.

Sas'safras, the popular and the technical name of a genus which contains but a single species, native to eastern North America. The trees usually are small, but occasionally become 125 feet in height. The root is largely used for the aromatic oil.

Satellite (*săt'ĕl-līt*), a small planet or moon. The term is generally employed in astronomy to denote one planet revolving about another; and hence satellites are sometimes called *secondary* planets, to distinguish them from the *primary* or larger planets. One of the chief points of interest in connection with satellites is that a satellite enables one to determine the mass of the primary as soon as the radius of its orbit, r, and its period, T, are known. For then, if we denote the mass of the primary by M and the mass of the secondary by m, we have

$$M+m=\left(\frac{2\pi}{T}\right)^2 r^3$$

and, since m is practically always negligible in comparison with M, we have

$$M=\left(\frac{2\pi}{T}\right)^2 r^3$$

For a list of the known satellites see *Webster's Unabridged Dictionary*, article *Solar System*. On the evolution of satellites see *Time and Tide* by Sir Robert Ball in the Romance of Science Series.

Sat'inwood, the wood of *Chloroxylon Swietenia* from India. The wood is deep yellow and remarkably close-grained, heavy and durable.

Satolli (*sä-tōl'lē*), Cardinal **Francesco,** a Roman Catholic prelate and diplomat of the papal see, was born at Perugia, Italy, July 21, 1831. In 1888 he was created archbishop of Lepanto, and in the following year represented the pope at Baltimore, Md., on the centenary of the Roman Catholic hierarchy and on the inauguration of the Roman Catholic university at Washington, D. C. In 1893 he came again to America as apostolic delegate with plenary powers, and in 1896 received the cardinal's hat. Cardinal Satolli is the author of a *Course of Philosophy* on the *Summa* of St. Thomas and of essays on various philosophical themes. In 1892 his action in regard to church controversies aroused opposition, but was sustained.

Sat'suma Ware, named from the province of Satsuma in Kiushu, is a fine pottery, almost like porcelain, which in its older examples is much sought. The ware has a yellowish glaze, and is ornamented in red, gold, green and silver. The Japanese excel in this hard pottery, although the Chinese are their superiors in the manufacture of porcelain proper. The Japanese employ glazing alloys of a kind unfamiliar in Europe, based generally on copper.

Sat'urn, an early Italian god who presided over farming, his name coming from the word meaning to sow. He most resembles Demeter of the Greek deities, but was later identified or confounded with the Greek Kronos. According to the Greek myth, Kronos the son of Uranos (heaven) and Gæa (earth) is the youngest of the Titans. He married Rhea, by whom he had several children, all of whom he devoured at their birth except the last, Zeus (Jupiter), whom his mother saved by a stratagem. The motive of Kronos was his hope of bringing to naught a prophecy which declared that his children would one day deprive him of his sovereignty, as he himself had done in the case of his father Uranos; but fate is stronger even than the gods, and when Zeus had grown up he began a ten years' war against Kronos and the Titans, ending in their being hurled down to Tartarus and there imprisoned. Other myths added that after his banishment from heaven Kronos went to Italy, where Janus gave him a share in his sovereignty. In this way Zeus' conquest of Kronos, a Greek myth, became the Roman myth of Jupiter's conquest of Saturn. Saturn thus became a divine king, who with fatherly mildness ruled the Italian natives and taught agriculture. Hence the whole

land received the name of Saturnia or Land of Plenty, and his reign was that golden age of which later poets sang. Saturn's temple in Rome stood at the foot of the Capitoline hill.

Saturn. See PLAN'ETS.

Saturnalia (*săt'ŭr-nā'lĭ-ȧ*), **The,** most probably were an old Italian harvest-festival. During the festival slaves sat down to banquets in their master's clothes, while he waited on them at table. Crowds filled the streets, and roamed the city in a peculiar dress; friends sent presents to each other; all business stopped; the courts closed; schoolboys got a holiday; and no war could be begun. The length of the Saturnalia varied at different times in Roman history, but they were usually held on Dec. 17, 18 and 19. The modern Italian carnival seems to be founded on the old pagan Saturnalia.

Satyrs (*sā'tẽrs*), in Greek myth, were a race of woodland deities, half human, half animal. They are generally described as roaming the hills in the train of Dionysus (Bacchus). They looked grotesque and repulsive. They were of robust build, with broad, snub noses, large, pointed ears, bristly and shaggy hair, rough skin, little horny knobs on their foreheads and small tails. They were fond of the woodland nymphs, of music, dancing, wine and sleep. They usually were hostile to man. The Roman poets regarded them as the fauns of their own myths, and gave them larger horns and goats' feet. Satyrs were often sculptured; for example, Praxiteles' famous *Satyr* at Athens.

Saul, the first king of Israel, was the son of Kish, a wealthy chief of the tribe of Benjamin. Gigantic in frame, noble in mien and commanding in character, he was well-fitted to unite the tribes. His deliverance of Jabesh Gilead and his victories over the Philistines, Ammonites and Amalekites gave unmistakable proof of ability as a soldier. But soon he became possessed of a wild madness which found vent in an insane jealousy of David, his son-in-law and the chief of his bodyguard, and in a fit of rage attempted David's life with his own hand. Saul fell in a disastrous and bloody battle with the Philistines on Mt. Gilboa about B. C. 1020.

Sault (*sōō*) **Ste. Marie, Mich.,** a port on St. Mary River (*q. v.*), near the outlet of Lake Superior, 290 miles northwest of Detroit. Two canals around the rapids or *sault* yearly pass nearly three times as much freight as Suez Canal. An immense iron-bridge connects the railroads from St. Paul and Duluth with those of Ontario. Population 12,615.

Sault Ste. Marie, Can., the most important center in the District of Algoma, opposite the American city of the same name, is an important manufacturing place, as well as famous for its immense canal-lock, built by the Canadian government and opened for traffic in 1895, between Lakes Superior and Huron. A larger tonnage passes through the canals at Sault Ste. Marie per year than through any other canal-system in the world. Large pulp and paper-mills, iron-smelters, steel-rail mills and other important industries make up a large industrial population at this point. The canal was built to overcome the rapids on St. Mary River. The Algoma Central, running north from Sault Ste. Marie, has been a great aid in the development of the district. A rich mining district is tributary to it. The length of the canal between the extreme ends of the entrance-piers is 5,967 feet. The lock is 900 feet by 60 feet. Depth of water over the sills (at lowest water-level) is 20 feet 3 inches. The total rise or lockage is 18 feet. Breadth at bottom is 141 feet 8 inches; at the surface of the water 150 feet. This canal has been constructed through St. Mary's Island on the northern side of the rapids of the river and with that gives communication on Canadian territory between Lakes Huron and Superior.

Savan'nah, Ga., a city and port on Savannah River, 18 miles from its mouth. It is situated upon a level, sandy bluff 46 feet above the river. Its streets are broad and shaded by beautiful trees, and its parks or squares at every other intersection of its streets invest it with unique beauty. Forsyth Park (33 acres) is one of the most attractive places in the south. Bull Street, the principal avenue, contains monuments to Nathanael Greene, W. W. Gordon, Lafayette McLaws, Francis S. Bartow, Sergeant Jasper, Count Pulaski and the Confederate dead. Telfair Academy of Arts and Sciences contains the finest collection of art south of Washington. A new city-hall costing $300,000, a new post-office building of Georgia marble, a custom-house, five hospitals, orphan-asylums, and a new high-school are among its public buildings. The Roman Catholic cathedral of the state is here, and also Christ's Church where John Wesley, the founder of Methodism, first preached in America. The school buildings are among the best in the country, and $220,000 are spent annually to maintain its excellent system of schools, which have 12,000 pupils and 260 teachers. Savannah is the leading naval-stores port in the world and the third in cotton. Its commerce is the largest of any south-Atlantic port, and it is rapidly growing. The city is noted for its beautiful streets, buildings, extensive commerce, artesian water-supply and its attractive suburban resorts. Savannah was founded by Oglethorpe in 1733, taken by the English in 1778, and by Sherman in December of 1864. Its population in 1900 was 54,244, and now is 80,000.

Savannah River, which with its right branch forms the boundary between Georgia and South Carolina, rises near the southern border of North Carolina and flows southeast to the Atlantic. It is 450 miles long, and is navigable from November to June for large vessels to Savannah and for steamboats to Augusta.

Save (*sāv*), a river in southern Austria, an important branch of the Danube, rises in Carniola, crosses Croatia, separates Bosnia and Servia on the south from Slavonia on the north, and falls into the Danube at Belgrade. It is 556 miles long and is navigable for 336 miles to Sissek in Croatia.

Savonarola (*sä'vō-nä-rō'lä*), **Girolamo,** an Italian reformer, was born at Ferrara, Sept. 21, 1452. He was taught at home, and in 1474 entered the Dominican order at Bologna. He first preached at the Dominican convent of San Marco in Florence in 1482, where his harsh voice and lack of the graces of a speaker caused his lectures to be deserted. After seven years' absence in another convent he appeared again before the Florentines, and this time his sterling genius and enthusiasm gained complete success, as he preached against the sins and luxuries of Florence, then at the height of its wealth and brilliancy, under Lorenzo the Magnificent. At this time he stood well with the government, and the church, the pope appointing him vicar-general to carry out a reform that Savonarola had proposed in the Dominican order in Tuscany. But about 1493 he began to preach plainly at the government, and in one of his sermons he referred to the coming of the French under Charles VIII; when what he had foretold happened, Savonarola was one of the committee sent to welcome the French king as the savior of Italy. When the French were forced to leave Florence, a republic was established, of which Savonarola, without holding any office, became the guiding spirit, his party, who were called *Piagnoni* or Weepers from the character of penitence which they professed, being in power. Savonarola aimed at making Florence a model of a Christian commonwealth. Gambling and other vices were sternly punished; vanities of dress were ruled by law; and under the enthusiasm which this prophet stirred among the people women flocked in troops to the public square to fling down their costliest jewelry, and his followers made a "bonfire of vanities" including cards, dice and carnival costumes. Meanwhile his denunciations which did not spare even the pope himself — Alexander VI — and his followers' claim that he was a heaven-sent prophet arrayed the church against him. He refused to go to Rome to answer a charge of heresy, and refused the offer of a cardinal's hat if he would change his style of preaching, and kept on preaching when forbidden by the pope. He was then excommunicated; the elections at Florence were carried by the party called the *Arrabbiati* or the Enraged against Savonarola's upright but vigorous government; and lastly, a Franciscan preacher having denounced him, an appeal was made to the ordeal of fire, a Franciscan and a Dominican monk agreeing to make a trial of this dread ordeal to prove which side in this quarrel was favored by Providence. The trial was not made, owing to difficulties and disputes, the failure destroying Savonarola's prestige among the people. No longer having the support of Florence, he was tried by a church council, tortured, and condemned as a heretic and an enemy of the state. So, on May 23, 1498, this extraordinary man and two other Dominicans were strangled and their bodies burned by the executioner. See his *Life* by Villari (English translation); Mrs. Oliphant's *Makers of Florence;* and George Eliot's *Romola.*

Saw'fish, a cartilaginous fish related to sharks and rays, with the snout prolonged into a bony blade and sharp teeth along each edge. The body is shaped like that of a shark, and the saw sometimes reaches a length of six feet. There are 16 to 20 pairs of teeth in different species. These fish normally are inhabitants of warm seas. They abound in the Mediterranean, and are found about the West Indies and off the southern coast of North America. They attack whales and large fish. With the saw they rasp off flesh which is eaten, and sometimes they rip open their prey. Their nostrils and mouth with small teeth are on the under surface of the head near the base of the saw.

Saxe-Coburg-Gotha (*kō'bûrg-gō'tä*), a duchy in Thuringia, one of the German states, area 764 square miles, with a population of 257,208. The principality consists chiefly of two detached portions, the duchy of Gotha in the north and the duchy of Coburg in the south, the chief towns of which are Gotha (population 39,553) and Coburg (population 23,789). The reigning family, until 1893, was represented by Duke Ernest II, who was succeeded by his nephew Prince Alfred of England, Duke of Edinburgh, who died in 1900. A son of the latter, heir presumptive, having died in 1899, the duke of Connaught became heir to the ducal throne; but, as he with his son renounced all claim to the succession, the throne fell to the present incumbent, Charles Edward, son of Prince Leopold (Duke of Albany). The latter succeeded on July 30, 1900. There are 173 miles of railway, the chief products being agricultural and the crop consisting largely of rye, wheat and barley.

Saxe (*săks*), **John Godfrey,** was born at Highgate, Vt., June 2, 1816. He graduated at Middlebury College, Vermont, in 1839,

became a lawyer and for seven years practiced in his native county. For six years he owned and edited a newspaper at Burlington. He also served a year as state's attorney and ran for governor on the Democratic ticket in 1859 and 1860. Saxe's poetry was mostly satirical and soon gained great popularity, his first volume going through over 40 editions. Among his verses are *The Proud Miss McBride*, *The Money King* and *The New Rape of the Lock*. Saxe died at Albany, N. Y., March 31, 1887.

Saxe, Maurice, Marshal, a celebrated soldier of the 18th century, was the natural son of Augustus II, Elector of Saxony, and the countess of Königsmark, and was born at Goslar, Hannover, Oct. 28, 1696. When only 12, he ran away to Flanders, joined the army of Marlborough, and took part in the capture of Lille and the siege of Tournay. With a boyish love of change he joined the Russo-Polish army in 1711 and distinguished himself under his father's own eyes. After fighting against the Turks in Hungary, he in 1726 was chosen Duke of Courland, and for three years stubbornly defended the duchy against both Russians and Poles. At length, forced to give it up, he fought under the Duke of Berwick, and decided the battle of Ettlingen by a desperate charge. On the breaking out of the Austrian War of Succession he was given command of an army to invade Bohemia, stormed Prague, and captured Egar. In 1744 he was made a marshal of France, put in command of the French army in Flanders, and with masterly genius kept a much larger force of the enemy inactive, at the same time capturing important fortresses. The following year was more glorious still; he defeated the Duke of Cumberland at Fontenoy, thus winning one of the greatest French victories over the English. Next year he won against the allies the brilliant victory of Raucoux, and in 1747 for the third time defeated Cumberland at Laufeldt and forced the allies to agree to the treaty of Aix-la-Chapelle. Saxe died on Nov. 30, 1750. George Sand was Saxe's great-granddaughter. See Carlyle's *Frederick the Great*.

Saxe-Meiningen (*săks-mī'nĭng-en*), a duchy in Thuringia, one of the states of the German empire. The charter of the duchy dates from 1829; its capital is Meiningen (population 15,985). The reigning duke is Georg II, son of Duke Bernhard I, who succeeded on the abdication of Duke Bernhard in 1866. The area of the duchy is 953 square miles, with a population, almost entirely Protestant, of 278,792. Like the duchy of Saxe-Coburg-Gotha, its products are mainly agricultural, the chief crops being rye, oats, wheat, hay and potatoes. It has 150 miles of railways.

Saxe-Weimar (*săks-vī'mär*), a grand-duchy of Thuringia, one of the German states, whose constitution dates from 1816. Its area (1,397 square miles, with a population of 387,316) consists of three detached districts — Weimar, Eisenach and Neustadt. The capital is Weimar (population 31,117), and the reigning grand-duke is Wilhelm Ernst. The government is an hereditary constitutional monarchy. The chief industry is agriculture, though there are some manufactures, mainly cotton and woolen. Weimar is famous as the home of Goethe, Herder and Schiller, the former long participating in the government. Duke Charles, about 1800, made Weimar the European Athens of his day.

Sax'horn, a series of brass, wind, musical instruments invented by Antoine or Adolphe Sax, who was born at Dinant, Belgium, in 1814, and settled at Paris in 1842. By means of this and another family of instruments called saxophones he has greatly influenced military music throughout the world. The saxhorn is a conical tube opening out to a wide bell, is sounded through a cupped mouthpiece, and is provided with valves or pistons like a cornet. Saxhorns are made in different sizes, the series having a very wide compass. Their number and variety supply all the different parts required by a brass band, and in many places good bands are wholly made up of them. From the fact that their fingering is all alike a performer having mastered one can by a little practice play as well on any of the others. Their compass, richness and flexibility of tone render them especially fit for military music, and their form makes them easy to play either on the march or on horseback.

Sax'ifrage. A genus of plants found in the north temperate and Arctic regions. It includes about 160 species, mostly perennial herbs, natives chiefly of mountainous tracts. Cultivated varieties are grown on rockeries. Some are densely tufted, moss-like plants, which form a flowery turf. The most common varieties in the United States are the early saxifrage found in Virginia, the swamp saxifrage in swamp-lands of Pennsylvania and the Chinese saxifrage, a hanging-basket plant Cultivated varieties grow well in good soil. The seed should be sown as soon as ripe in a cold-frame; or saxifrages may be propagated by division in the spring.

Sax'ons, a Germanic people, whose name is thought to come from an old word meaning knife. A Saxon league was formed in the 3d century of tribes living along the Elbe inlet and on the neighboring islands. The Saxons invaded Roman territory in the reigns of Julian and Valentinian, and about 450 they, with the Angles, established permanent settlements in England (*q. v.*) and founded the Anglo-Saxon kingdoms. Before the 5th century they had settled along the French sea-coast from the Elbe to the

Loire, but these settlements soon became a part of the kingdom of the Franks. At home the Old-Saxons widened their country till it embraced all between the Rhine and Elbe, the North Sea and the Harz Mountains. Saxons and Franks together destroyed the Thuringian kingdom in 531. The Frankish war of conquest was waged against the Saxons from 719 to 804, the Franks at last conquering under Charlemagne, in spite of the stubborn defense of the Saxons under their leader Wittekind. The Saxons gave up their pagan worship with their freedom, and accepted Christianity.

Sax'ony, a German kingdom, in area the fifth and in population the third state of the empire; it covers 5,787 square miles, and has a population of 4,802,485. For the present state of Saxony see GERMAN EMPIRE.

After the division of the territories ruled over by Charlemagne, the Frankish conqueror of the Saxons, that nation became a part of Austrasia. Its first duke was Otto (880–912). His son Henry made himself master of all the territories included in the present kingdom of Saxony, the Prussian province of Saxony, the smaller Saxon duchies and more besides. The German emperors after 1024 were Franconians and their greatest enemies were the Saxon dukes, especially Henry the Proud of Bavaria and Henry the Lion. Rudolph II (1356–70) first took the title of Elector of Saxony. During the Thirty Years' War Elector John George I (1611–56) sided with the Protestants, but in 1635 made his peace with the emperor, on which account his lands were ravaged by the Swedes for ten years. Frederick Augustus I (1694–1733) became a Roman Catholic and was chosen king of Poland. After that the headship of the Protestant states of Germany passed to the Elector of Brandenburg, and to this day the court of Saxony is Roman Catholic. Saxony warred against Charles XII of Sweden and suffered greatly at his hands; was defeated by Prussia in the second Silesian War; and was conquered by Frederick the Great in the Seven Years' War. Frederick Augustus III (1763–1827) proclaimed himself king of Saxony, and sent his army to support Napoleon. For this the Congress of Vienna took over half his territory to form the new province of Prussian Saxony. In the Austro-Prussian war of 1866 Saxony sided with Austria, was defeated, and joined the North German Confederation. In the Franco-Prussian War the Saxon army fought on the side of Prussia, and since 1871 Saxony has been a part of the German empire.

Saxophone (*săks'ō-fōn*), the name of a group of musical instruments invented by Adolphe Sax. (See SAXHORN.) The saxophone is a conical, brass tube, sounded by a mouthpiece furnished with a single reed like that of a clarinet, and is made in as many different keys as the saxhorn. It has 20 holes, covered by keys and studs, for the first three fingers of each hand. All saxophones are fingered alike. They are greatly valued in military music, but are not much used in orchestras.

Sax'ton, Joseph, American inventor, was born at Huntingdon, Pa., March 22, 1799, and died at Washington, D. C., Oct 26, 1873. At an early age he showed much mechanical ingenuity, which manifested itself later in inventions and improvements in connection with the mechanism of clocks; he constructed the clock for the tower of Independence Hall, Philadelphia, and superintended the construction of the machinery and delicate weighing-balances for the Philadelphia mint. He spent some years, early in the thirties, in England, and while there constructed a magneto-electrical machine, by which the first magnetic spark was obtained; he made much of the apparatus used by Wheatstone, the physicist and inventor; and devised a locomotive differential pulley. Among his other inventions were a deep-sea thermometer, an immersed hydrometer and a self-registering tide-gauge. He was one of the founders of the American Academy of Sciences.

Sayce (*sās*), **Archibald Henry,** one of the greatest of living philologists and archæologists, was born at Shirehampton, England, Sept. 25, 1846. After attending Grosvenor College at Bath, he entered Queen's College, Oxford, in 1865, and became a fellow and tutor of his college. In 1876 he was appointed assistant to Max. Müller in the chair of comparative philology at Oxford, which he resigned in 1890. Professor Sayce was a member of the Old Testament revision-committee in 1874. The most important among his many books, which rank among the first in scholarship and value, are *Ancient Empires of the East, Fresh Light from the Monuments, The Hittites* and *Races of the Old Testament.*

Scale (in plants). The word has two applications. Epidermal outgrowths, which technically are hairs, sometimes assume the form of scales which more or less overlap one another. The more general application of the term, however, is in connection with the protecting leaves of scaly buds or the reduced leaves of underground stems. Such leaves are not green, are not much developed, and often are firmer than ordinary leaf-tissue. The scales of underground stems probably are merely reduced leaves, with no function; the scales of aërial buds, however, are distinctly protective organs, and not only are firm and resistant, but are frequently covered with hairs or gummy products.

Scale-In'sects, the name of a large number of flat insects, with scale-like bodies, of

the family *Coccidæ*, also called scale-bug or bark-louse They live on the sap of plants. Almost all are looked upon as pests, doing much damage to fruit-trees, shade-trees and smaller plants. Among the most important are the cottony cushion or fluted scale; long-spined mealy bug; destructive mealy bug; cottony maple scale; barnacle; Florida wax; soft; terrapin; hemispherical; black; orange chionaspis; scurfy bark-louse; West Indian peach scale; horse-chestnut; Putnam or cranberry; linden; European fruit; cherry or Forbes; grape; walnut; palm, San José; greedy; oleander; circular; California red; Glover's or long; oyster-shell bark-louse; purple scale; white fluted or mealy wing. The cottony-cushion scale did a great amount of injury to trees in California, and was combated by introducing a lady-bird which preyed upon it. A scale-insect which forms a large cottony egg-case, making it a conspicuous object on the trees, has done much injury to maple-trees in various parts of the United States. The scale-insects infesting orange and lemon trees have done very great damage; including the long, purple, Florida red and chaff scales. the orange chionaspis, California red, the white or fluted and the black. The San José scale has worked wide-spread damage in the country; the pest has spread from California to every state in the Union. It does not attack the citrus-fruits; but other orchards suffer greatly from it young peach-trees markedly so, and shade and ornamental trees are greatly injured thereby. It is spread by nursery-stock and by fruit. When the pest is present, twigs are marked by a gray, scaly substance. Consult *Bulletin 88*, Mass. Agricultural College; Marlatt: *Farmers' Bulletin 172*, U. S. Department of Agriculture, 1903; and Comstock: *Manual for Study of Insects*. For remedies see SPRAYING-MIXTURES.

Scal'lop (*skŏl'lŭp*), numerous widely distributed and well-known mollusks inhabiting salt water. Their shells are marked with radially arranged ridges and are often bright-colored. The animal living within is somewhat like a clam, with a slender foot, orange or reddish in color. The mantle, which covers the animal and secretes the shell, is provided with many, small, sparkling eyes arranged around the margin. Those show when the shell is open. When young, scallops swim by opening and shutting the valves of their shells; but, as they grow older, they become sedentary. The larger scallop-shells are often used for baking and serving shredded fish and oysters in cracker-crumbs.

Scalp, the outer covering of the skull. Its skin does not differ from that of the rest of the body, except that hair grows on it more abundantly. Besides the skin, the scalp is formed of an expanded muscle or tendon and cellular tissue and blood-vessels. Scalping was a favorite practice of the American Indians in war, in which the scalp with the hair attached was partly cut and partly torn away, the victim being either alive or dead. The scalps were worn as trophies by the warriors.

Scan'derbeg. (Iskander Beg or Bey), an Albanian chieftain, was born in Albania, about 1403, of Servian parents. He was called George Castriota by the Christians. He was carried away by the Turks when seven, and brought up a Mohammedan. His bravery and skill made him a favorite with the sultan, who put him in command of a division of his army. In 1443 he deserted the Turkish army with 300 Albanians, and renounced Mohammedanism. In less than a month the whole of Albania was in arms, Scanderbeg was chosen chief, and the Turkish garrisons driven out of the country He was defeated by the Turks but once in all the struggles that followed, destroying 40,000 Turks, with 15,000 Albanians, and defying the Sultan himself with his army of 150,000, until he retired disgusted from the conflict. Pope Pius II tried in vain to league the Christian princes together to help Scanderbeg in his conflicts with the Turks, but succeeded in inducing him to break a truce of peace, made in 1461, and renew the war alone. He again defeated every force that attacked him, even driving back Mohammed II, the conqueror of Constantinople, who conducted two campaigns against him in person. Scanderbeg died at Alessio, of malarial fever, Jan. 17, 1468. Consult Ludlow's *Captain of the Janizaries*.

Scan'dina'via, a long peninsula in the north of Europe, lying on the Arctic Ocean, the Norwegian Sea, the Baltic Sea and the Gulf of Bothnia. Geographically it includes Norway and Sweden, historically Denmark and Iceland, while its literature includes the literary works of the Swedish race in Finland even. See DENMARK, LITERATURE, NORWAY and SWEDEN.

Scarabæus (*skăr'ă-bē'ŭs*), a name commonly restricted to the tumble-bugs or dung-beetles, but properly including other members of the large family *Scarabæidæ*. The tumble-bugs form round balls of dung and roll them considerable distances, and finally bury them in the ground. The female lays an egg in this mass, which serves as food for the larva after the egg hatches. The most famous scarab is the sacred beetle of the ancient Egyptians. These were highly venerated and placed in tombs with their dead, where four different species have been preserved. A strange symbolism grew up in reference to these insects. The ball they rolled was taken to represent the earth, the rayed head of the insect the sun, the 30 joints in their six tarsi the days of the month. They became accepted as

emblems of power and resurrection. They are found sculptured on monuments and tombs. Gems were also cut in the form of the scarab and worn in rings and amulets. The Greeks and Etruscans borrowed this custom of engraving the scarabæus on gems.

Scar'let Tan'ager. See TANAGER.

Scheffer (*shĕf'fĕr*), **Ary,** a painter, was born at Dordrecht, Holland, Feb. 12, 1795, and studied in Paris. His first pictures were inspired by Goethe's, Byron's and Dante's poems, and included *Margaret at the Well, Faust in His Study, Suliote Women* and the well-known *Dante and Beatrice in Heaven.* After 1835 he turned to religious subjects. painting *Christus Consolator* (Christ the Consoler), *Temptation of Christ, St. Augustine and Monica* and others. His pictures are chiefly remarkable for depth of feeling and refinement of expression. Collectors prize them so highly that in 1870 even a small replica sold for $9,607. Some of his best portraits are those of Lafayette, Madame Guizot, Talleyrand, Liszt and Lamartine. He died at Argenteuil, near Paris, June 5, 1858. See *Memoir* by Mrs. Grote.

Scheldt (*skĕlt*), a river of Europe, rising in France, flowing north through Belgium past Ghent and Antwerp, enters the North Sea at Flushing by two arms, going north and south of two small islands. It is 267 miles long and navigable for 211 miles. The Dutch claimed the navigation of the lower Scheldt in the 17th and 18th centuries and demanded toll of all foreign vessels sailing on it. In 1831 the rights passed to Belgium when it separated from Holland. In 1863 Belgium gave up the claim for $3,750,000 paid by foreign nations.

Schelling (*shĕl'ĭng*), **Friedrich Wilhelm Joseph,** a German philosopher, was born at Württemberg, Jan. 27, 1775. He studied theology and philosophy at Tübingen and science and mathematics at Leipsic. He succeeded Fitchte as teacher of philosophy in the University of Jena in 1798. From 1803 to 1808 he was professor at Wurzburg; until 1820 secretary of the Royal Academy of Arts at Munich; professor at Erlangen until 1827, when he returned to Munich to a position in the new university there; and finally was called to Berlin by King William IV in 1841. He died in Switzerland in 1854. He began as a follower in philosophy of Fitchte and Hegel, with whom he ranks among German philosophers, but later was influenced by Spinoza and Boehme. His many philosophical works include the *Inquiry into the Nature of Human Freedom, The Possibility of Any Form of Philosophy, Philosophy of Nature* and *The World-Soul.* See Morell's *History of Philosophy.*

Schenck (*skĕnk*), **Robert Cumming,** American soldier and diplomat, was born at Franklin, O., Oct. 4, 1809, and died at Washington, D. C., March 23, 1890. He served eight years in Congress (1843-51), when he was appointed minister to Brazil. He was afterwards sent on diplomatic missions to Buenos Aires, Montevideo and Paraguay. In the Civil War he was appointed (May, 1861) brigadier-general of volunteers and took part in the two battles of Bull Run as well as in that at Cross Keys. In September, 1862, he was promoted major-general and given command at Baltimore, which he protected during Lee's invasion of Maryland. From 1863 to 1871 he represented Ohio in Congress on the Republican side, and from 1871 to 1876 was minister to Great Britain. He rendered distinguished service in bringing about Anglo-American arbitration of the *Alabama* claims He subsequently practiced law at Washington, D. C.

Schenectady (*ske nĕk'tà-dĭ*) **N. Y.,** a city, county-seat of Schenectady County, 17 miles northwest of Albany. It is on Mohawk River and Barge Canal and is a manufacturing city. It has the works of the General Electric Company, which employs 15,000 people, and the Westinghouse electric works; besides knitting-mills stove-foundries, locomotive-works and pump, steel springs, wire-railings, wheelbarrow and broom factories. The principal public buildings are the post-office, county court-house, municipal buildings, Van Curler opera-house, state armory, Home of the Friendless, Children's Home, Ellis Hospital and Y. M. C. A. building. It is the seat of Union College, founded in 1795, and with the law and medical schools and Dudley observatory at Albany and the academic and engineering departments in Schenectady, forming Union University Schenectady has 22 churches and excellent parochial and public schools, the public high school being known as Union Classical Institute. This school owns its library and the city has a beautiful, free, public library. Schenectady was settled by the Dutch in 1661 In 1690 it was burned and the citizens massacred by the French and Indians. Population 72,826.

Schiller (*shĭl'lĕr*), **Johann Christoph Friedrich,** a German poet, was born at Marbach, in Württemberg, Nov 10, 1759. He studied law and then medicine in the school at Ludwigsburg, established by Duke Carl Eugen of Württemberg, where he received three medals, though he had spent more time in reading and writing poetry than in studying medicine. His first play, *The Robbers,* in 1782, was produced at Mannheim. The people were so eager for it that they filled the theater at noon, five hours before the play began, and it made a tremendous sensation, being full of the revolutionary spirit that preceded the French Revolution. Because Schiller had twice left Stuttgart without the permission of the duke, he was arrested and forbidden to write plays or to leave Württemberg, which led to his flight to Mannheim under

the name of Dr. Ritter. For a time he was dramatist to the theater in Mannheim and published a theatrical journal in which appeared many of his best poems and a part of *Don Carlos*, finished later at Dresden. He kept up his philosophical and historical studies, and in 1788 was given a professorship at Jena and a pension by the duke of Saxe-Weimar which enabled him to marry. His historical works of this period are the *Revolt of the Netherlands* and the *Thirty Years' War*. In 1794 began Schiller's friendship with Goethe, and under the stimulus of his intercourse with him he again began to write poetry, especially his ballads that have made him the people's poet. His drama of *Wallenstein*, written when every hour's writing cost hours of suffering, was finished in 1799. Carlyle calls it "the greatest dramatic work of the 18th century." Settling at Weimar in 1799, to be near Goethe, he wrote *Mary Stuart*, *The Maid of Orleans*, *The Bride of Messina* and *William Tell*, his last finished work. He died, while still young and in his intellectual prime, on May 9, 1805. See *Life* by Carlyle; *Life* by Nevinson in the Great Writers Series; and translations of *Wallenstein's Death* and *Piccolomini* by Coleridge.

Schlegel (*shlā'gel*), **August Wilhelm,** a German critic and poet, was born at Hannover, Sept. 8, 1767. He studied theology at Göttingen, but soon turned to literature, writing poems and other articles for magazines. He was made professor of literature and fine arts at the University of Jena, and lectured at Berlin on the same subjects and at Vienna in 1808. In 1818 he became professor at Bonn. He translated into German verse most of the works of Shakespeare and many of those of Cervantes, Dante, Calderon and Camoens. His translation of Shakespeare, revised by Tieck, is still the classic German version. His critical writings and his lectures were published in three collections. He died at Bonn, May 12, 1845.

Schlegel, Friedrich von, German critic and writer, was born at Hannover, March 10, 1772. He studied at Göttingen and Leipsic, and then began a literary life. He edited with his brother *The Athenæum*, and also, in connection with him, wrote a series of critical essays, which gave an impulse to good work in German literature. His best-known works are *Philosophy of History* and *History of Literature*, two series of lectures delivered at Vienna. His book on *The Language and Wisdom of India* was a pioneer in the study of Sanskrit in Europe. His works are collected in 15 volumes. He died at Dresden, Jan. 11, 1829.

Schleiermacher (*shlī'ĕr-mā'kĕr*), **Friedrich Ernst Daniel,** a great German theologian, was born at Breslau, Prussia, Nov. 21, 1768. He studied at the Moravian schools and afterwards at Halle. While preaching at Berlin, he published the first of the works which made him known to the learned world. In 1804 he became a professor at Halle. After that university was closed in 1806 by Napoleon, he returned to Berlin and was active in founding the University of Berlin, in which he became a professor in 1810. His lectures on philosophy and theology brought crowds of students and his sermons increased his influence. His writings also continued, and besides many theological works, which placed him next to Luther as a theologian, his friends after his death published several volumes from his manuscripts. He died on Feb. 12, 1834. See Lichtenberger's *History of German Theology in the Nineteenth Century* and Schleiermacher's own *Autobiography*.

Schley (*slī*), **Winfield Scott,** rear-admiral in the United States navy, was born near Frederick, Md., Oct. 9, 1839. He graduated from the Naval Academy in 1860, and served during the Civil War. He was in command of the Greely relief expedition which sailed in 1884. As commodore he was placed in command of the flying squadron in the war with Spain, and for conspicuous service in the battle of Santiago (July 3, 1898) he was made rear-admiral. In the autumn of 1901 Admiral Schley figured in a court of inquiry arising out of professional controversies between himself and Admiral Sampson respecting the share of honors each was entitled to in the destruction of the Spanish fleet. He died Oct. 2, 1911.

WINFIELD S. SCHLEY

Schliemann (*shlē'mān*), **Heinrich,** a German scholar, born at Mecklenburg-Schwerin, Jan. 6, 1822. While in business in St. Petersburg he mastered Greek and the modern languages of Europe. Becoming convinced that the heaps of Hissarlik in Asia Minor covered the site of ancient Troy, when he possessed an independent fortune, he began in 1870 to excavate it at his own cost, carrying on the work for twelve years. He had to pay the Turkish government $10,000 for carrying off all the treasures he unearthed contrary to agreement. His collection is now in the Ethnological Museum at Berlin. In 1876 Schliemann began excavations on the site of the ancient city of Mycenæ in Greece, and the treasures found there are now preserved at Athens. He wrote an account of his work in *Mycenæ and Tiryns*, *Ilios*, *Troja* (Troy) and other volumes. He died at Naples, Dec. 27, 1890, and was buried at Athens.

Schmalkald (*shmäl'kält*), **League of,** an alliance formed at Schmalkalden, a town in Hesse-Nassau, Germany, April 4, 1531, be-

tween nine Protestant princes and eleven imperial cities. Other princes and cities afterward joined the league, until it included nearly all the Protestant states from Denmark to Switzerland. The object of the league was the protection of the Protestants against Charles V and the Roman states. The *Articles of Smalkald*, adopted by the league, were drawn up by Luther at Wittenberg. At the battle of Mühlberg, April 24, 1547, the Protestants, weakened by the withdrawal of Duke Maurice of Saxony, were defeated and the league was broken up.

Schnitz'er, Eduard. See EMIN PASHA.

Scho'field, John McAllister, an American general, was born in New York state in 1831. A graduate of West Point, he was made a professor there in 1855. When the Civil War broke out, he entered the army as major of the 1st Missouri volunteers, and was on General Lyon's staff when the latter was killed at the battle of Wilson's Creek. He was in command in Missouri until February, 1864, and then of the army of the Ohio. He shared Sherman's southern campaign, and was in most of the battles which ended with the taking of Atlanta, when he returned to Tennessee, defeating Hood at Franklin, and was with General Thomas at the battle of Nashville. Entering North Carolina, he took Wilmington and again joined Sherman, for whom he drew up the supplementary articles of surrender of Johnston's army, which were afterwards approved by the government. In 1868 he became secretary of war and major-general in the regular army. Upon the death of General Sheridan in 1888, he succeeded to the command of the United States army. Previous to his retirement he was, by act of Congress, made lieutenant-general, Feb. 7, 1895. He wrote *Forty-six Years in the Army*. He died on March 4, 1906.

GENERAL SCHOFIELD.

School'craft, Henry Rowe, an American writer, was born in the state of New York, March 28, 1793. After studying at Union College, he visited the mining-region west of the Mississippi and also acted as geologist in an exploring expedition to Lake Superior and the Upper Mississippi under General Cass. In 1822 he was Indian agent for the tribes about the lakes, and in 1823 married the granddaughter of an Ojibway chief who had been educated in Europe. While Indian agent he made treaties that gave the United States 16,000,000 acres. As a member of the legislature of Michigan Territory, 1828–32, he founded its historical society. An expedition which he commanded in 1832 discovered the sources of the Mississippi. After collecting the statistics of the Six Nations, he was employed by Congress in 1847 to gather all the information possible about the Indian tribes, the result being published in five volumes, costing the government $30,000 a volume. He added a sixth volume to the collection in 1857. His works include narratives of his journeys, namely, *Notes on the Iroquois; The Red Race of America; Thirty Years with Indian Tribes* and *The Indian in His Wigwam*. He died at Washington, D. C., on Dec. 10, 1864.

School-Garden, The. Among progressive school-people there is a growing interest in the school-garden. In cities, in normal schools and even in the country, the school-children are set to work cultivating flower and vegetable gardens. The school-garden is an outgrowth of regular school-work; it is one striking phase of the effort to get out of doors, away from books and into contact with the real world. It is a healthy realism putting more vigor and intensity into school-work.

The school-garden has an important relation to several school-studies. First of these is nature-study. There is no better way of bringing children into contact with plant-life than by raising flowers and vegetables in the garden. The boys and girls get out of doors, prepare the soil, plant the seed, watch with great interest the growth of plants, cultivate them through the season, and finally observe the growth and ripening of the fruit. This whole cycle of growth and change is the most fundamental thing in plant-study, and nothing can be more interesting to children than this process when they themselves are concerned in the products of the garden. In the second place the garden has a very important place in the study of geography. In the home-geography in the early grades classes of children are required to visit the gardens and study the processes of cultivation and marketing the products. These are fundamental lessons in geography. In this way gardening leads on to agriculture, scientific farming, fruit-raising and the improvement of country life generally.

There is a strong tendency in all parts of the country to turn the attention of children strongly toward these outdoor studies. The garden naturally suggests farming, the raising of corn and other grains, the feeding of cattle, dairying and butter-making, fruit-culture, as of berries, stone-fruits, apples and pears. Scientific agriculture and fruit-raising are based on principles of careful selection of seed and of wise cultivation, of fertilizing and preserving soils, of grafting, pruning and caring for fruit-trees and of spraying against insect-pests. All these things are vitally interesting to children, and put new meaning into country life.

The school-garden even has an important relation to esthetics. Floriculture, landscape-gardening, tree-planting and fruit-culture appeal to the sense of beauty. The whole yard and garden together need to be planted and laid out on principles of taste and attractiveness.

Perhaps the most important relation of the school-garden is that to the home. Where boys and girls become properly interested in the school-garden, they naturally desire to raise a garden at home in their own back-yard and perhaps flower-beds and trees in the front yard. This answers in many ways to the necessities and comforts of the home. The whole town may take on a new appearance, in its yards and gardens, on account of this interest developed in the school-garden. Beauty and utility are here combined in the best way; the home-table is supplied with vegetables and beautified by the flowers which the children themselves raise.

The educative effect upon the boy or girl of carrying out through the whole season plans for cultivating a garden is one of the best products of good training. The cultivation of plants requires constant attention, forethought, intelligence, self-reliance and a kind of originality; difficulties are to be met and overcome. Insects infest the plants and must be gotten rid of; chickens scratch up and spoil the garden and a fence is needed for protection; a dry spell calls for some plan of watering; weeds quickly take possession of a garden; and the child must be intelligent and thoughtful in meeting such difficulties. This is the best kind of training. To say the least, it is far better than letting the boy run wild on the streets and getting into all sorts of mischief.

Most of our progressive normal schools in all parts of the country are taking up the problem of school-gardens, not for the children simply but for the teachers. Young teachers are set to work to learn the whole problem, so that they may later guide the children in garden work. It is clear that the school-garden is to occupy an important place in the future education of boys and girls.

The value of school-gardens in education has long been recognized in Europe. They were started as early as 1819 in Schleswig-Holstein. In 1869 they were prescribed by law in Austria and Sweden, in Belgium since 1873 and in France since 1880. There are at present about 20,000 schools in Austria having gardens, 45,000 in France, 8,000 in Russia and 2,500 in Sweden. The number in the latter country once was double the present number, but has decreased since the introduction of manual training. School gardening is practically obligatory for the children of the common schools of Belgium, Netherlands, British West Indies and Ceylon. Many German cities teach agriculture by "demonstration" in which the pupils are not allowed any share. Many of the schools of France and Germany have gardens "not with a view to instructing the pupils in agriculture, but for the benefit of the teachers." Many of the foreign governments subsidize the school-gardens, offer prizes, and make training in agriculture obligatory for normal-school graduates.

It may be said in conclusion that school-gardens have an important relation to manual training and to the whole subject of industrial education. It is a phase of manual training to teach children to use the tools and implements of the garden, to prepare the soil and carefully cultivate plants. It is an outdoor physical training combined with intelligent mental effort quite equal in its effects to shop-work and in some ways superior.

Some of the great universities, like Cornell, Illinois, Ohio and Louisiana, have taken up the problem of school agriculture, country life and scientific farming in earnest Pamphlets are published by experts of agriculture dealing with important phases of school agriculture and school-gardens. Consult Jewell's *Agricultural Education* (Bul. 368, U. S. Bureau of Education).

C. A. McMURRY.

School Or'ganiza'tion and Man'agement, as a somewhat distinct problem calls for elaborate treatment. It embraces the plans of organization, the sources of revenue, the selection of school-sites, the erection of school-buildings, seating, ventilating, lighting and sanitation; the courses of study, choice of textbooks, classification of pupils, preparation and examination of teachers; the general supervision f the school, the authority of the teacher, the management of the classes, rules of conduct, modes of punishment, presentation of motives, relation of teacher and pupils. The student is referred to the following authorities for a general treatment of these problems: *School Economy*, Wickersham; *School Supervision*, Payne; *School Interests and Duties*, King; *School Management*, White; *School Management*, Kellogg; *Theory and Practice of Teaching*, Page; *Systems of Education*, Gill; and *School Hygiene*, Kotelmann (Bergstrom's translation). For detailed treatment of special phases of this broad subject see *Teacher's College Contribution to Education*, Teacher's College, Columbia University.

School San'ita'tion may be defined as the application of knowledge and of the laws of science with a view to the preservation and promotion of the health of those attending school. Formerly the term included little more than the proper heating, lighting and ventilation of school-buildings; but it has been extended to include all factors with which it is practicable for the school to deal, which concern the health of the pupil, as the detection of defects of

sight and hearing, contagious diseases, adenoid growths, causes of malnutrition. In some schools even the teeth of the children are periodically examined by a dentist, who gives free individual advice regarding their care.

As to heating and ventilation, in general that system will be the best which will in the simplest way possible effect an even heat throughout, with sufficient change of air and avoidance of direct draughts upon the pupils. Fire-places are very desirable whenever architectural conditions will permit them. When in use, they insure the best of ventilation and are excellent for furnishing the small amount of heat often required in spring and fall. If a stove is used for heating purposes, it should be surrounded by a zinc jacket extending from the bottom to a distance of several feet above it, to prevent direct radiation. Air is heated at the bottom and rises to the top of the jacket and thus a fair degree of circulation is insured. The chimney should be large and bisected vertically, half being used for the escape of smoke and the other half for the escape of foul air. In large buildings a force-fan is necessary to insure continuous circulation. This can be provided at small cost. Good ventilation demands 2,000 cubic feet of pure air *per* pupil *per* hour. Teachers should assure themselves from time to time as to whether the ventilation system is working, by seeing whether there is sufficient draught up the foul-air flue to draw in a small scrap of paper. For large buildings heating by steam-pipes is preferable to that by hot air, as with hot air it is difficult to have the heat evenly distributed on windy days.

The essential thing in lighting a schoolroom is to secure sufficient light without having it fall directly upon the eyes of the pupils or teacher. For this reason it is best to have all the light come from one side of the room, preferably from the left.

Such good school-desks are now manufactured that there is no excuse for the failure to have pupils hygienically seated at desks adapted to their size.

Teachers should always be on the alert for the detection of any physical defects in their pupils, and these when noticed should be reported at once to the proper persons. Every school should be examined from time to time by a physician with reference to the physical defects of the children.

School-Ships are used to train officers and gunners for the naval service. In the United States seamen-gunners are trained at Newport and gun-captains on training-ships at Port Royal, S. C. The old English battleships *Britannia* and *Hindostan* at Portsmouth, England, are used as school-ships. School-ships are sometimes employed as reformatories, but even in this case they graduate most of their pupils into the navy.

School-Song, The. Since the rote-song in music, like the story in literature, proves to be the "Open! sesame" of interest to the child, a careful selection of such songs should be made for their initial educational value. The following examples serve to illustrate the uses of song in meeting the problems of music-training for school-grades. The work is divided into three periods: Imitative and Dramatic Period; Investigative Period; and Constructive Period, the different steps showing the development of the subject.

IMITATIVE AND DRAMATIC PERIOD.

In the popular musical pleasantry, *The Chicken*, by Neidlinger the entire spirit of the words is carried over into the music, which naturally represents their meaning in pitch and vocal inflection:

I think when a little chicken drinks
He takes the water in his bill
And then he holds his head way up
So the water can run down hill.

Much to the delight of the little child the water musically "runs down hill" through the descending scale-passage, while the entire song blends speech and song.

The Call of the Crow is a charming bit of musical imaginery by Mrs. Knowlton. To a melodious accompaniment is given the simple call of the crow on two notes for the middle voice, which may be realistically interpreted by the children at first. Later the *caw* suggests a natural vocal lesson, opening and relaxing the throat as adequately as would an Italian exercise. In the two chanting phrases which follow, speech and song are blended:

Over the standing corn
The cheery cry is borne.

Such words as "corn" and "borne" suggest vocal emphasis upon round, open tones. A change of mood is shown at the close in an accompanying note of regret to the words:

How I wish I could go with him,
Where the woods are wild and dim.

The entire song is made on five notes of the scale and, while naturally told, is thoroughly musical and poetic.

The familiar *Mother-Goose* rime set to music by L. Orth:

Blow, wind, blow; go, mill, go,
That the miller may grind his corn;
That the baker may take it
And into rolls make it
And fetch us some hot in the morn.
Blow, wind.

gives contrasting movements, slow and fast; broad, full vowels of the first phase, short, quick vowels and rapid enunciation in the second part. The words and increased *tempo* suggest action, the turning of wheels, grinding, kneading and baking. The whole song is an action story which the children will take pleasure in repre-

senting. The broad vowel and breathing involved in the word "blow" furnish the material for a good music-lesson, as does the *tempo*, fast and slow, which can be converted into accented time and divided beat, again to be defined by clapping, tapping or marking on the board. The last part of the song repeats phrases of the first and second part, thus closing in good musical form. In this song we have a capital story in music and words, vowel-coloring, repetition of phrases, rhythm, dramatic representation and musical form, besides the suggestions arising from a well-composed accompaniment.

Stevenson's *Bring the Comb* (Modern Music Series, First Book) pictures a mimic band and soldier drill, presenting the problems of rhythm in a playful way. The soldiers mark time and keep step to the drum-beat of the two strong pulses of the measure. In clapping out the pattern of the fife and rat-a-tat-tat of the snare-drum and, later, with the aid of drums and toy instruments, the children define the melody, learning to contrast the elements of time and tune.

For further illustrations in pitch and time, such songs as *The Chicken* and *Katydid* (Knowlton) will be helpful for pitch-studies in high, low and medium tones of songs. Neidlinger's *Robin* and *Squirrel* give good practice in ascending and descending passages. The rhythmic suggestion in *Snow-Balls* and *Scissors-Grinder* (Knowlton) will be freely acted. Favorite rhymes and *Mother Goose* will serve for initial time-lessons in recognizing groups of twos, threes and fours. Miss Bentley's song-primer, the *Zoo*, *Clock* and others give happy suggestions of scale, pitch, time and rhythm lessons for this first period.

First Step. Through these songs the child is introduced to a concrete, musical experience, which must tend to vitalize all his later study. Here he learns to express himself freely in song, to respond to rhythm and to appreciate harmony. On account of his limited power, he will distribute his interest equally over words, rhythm and melody. The words of the song will be helpful in enlarging his vocabulary, in making associations with color, sound, motion and number. The motor-side of music will strongly appeal, leading out into gesture and dramatic action in rhythms, games and dances. The child also becomes familiar with a variety of musical forms, which prepare him for future analysis and reasoning.

Advanced Step. The ear-training and naming of pitch from songs of the preceding stage are followed by translating from memory into syllables; also by recording them in notation. This will be found a helpful transitional step to the sight-singing of the next grade. Simple tonic phrases from Knowlton's *What Robin Told*, *The Crow*, *The Postman*, *The Soldier*, "Workshop's Primer" (Modern Music Series) have been offered by the children, when asked to sing parts of songs from memory.

Original song-making on the part of the children at this period helps to define the phrase and lead to music-construction. The song-sentence, the couplet and quatrain both in words and music can thus be produced, acquainting children with meter and time groups in a practical way.

Folk-games and dances related to the work of the grade carry on the training in rhythm and unite the musical experiences in a larger dramatic whole. Some of the old guild-dances, *Shoemaker*, *The Wool-Weaving* and *Harvest-Dances* of a more formal kind take the place of the freer dramatic games of the earlier period.

The teaching points to be gained might be stated as follows: To gain the expressive use of song,

1. The character of the song should be dramatic and directly related to the child's interest and to school subjects. The song should be used as a story, told in simple language with melody and rhythm directly representative of the content of the words.

2. The vocal aim at this period is to gain fluency of utterance in word and tone. A close relation between tone and language should be kept by means of a study of imitative sounds and words, as expressed in the songs. The children should learn to recognize and group sounds by their qualities, as round, sharp, bright, rolling or humming, leading to combined vocal and reading phonetics. In this way simple vocal exercises in *oh*, *ah*, *e* and *oo* will be drawn directly from the song, as suggested in the *Blow*, *Wind*. Breath-exercises should be developed in the same way.

3. Pitch will first be discovered as sounds in nature and environment are represented, in such songs as *Call of Crow*, *Katydid* and *Steam-Whistle*. This will first be described as high, low and medium, gradually defining the scale. The sequence of tones, or expressive pitch used in the phrases of the songs, develops melody.

4. Rhythm will first be defined by the motions and movements of the body, power to walk, run, skip and march; in the imitations of nature and movements of things these will be further defined by clapping, marching, skipping and acting the various songs as above shown. Thus the pulse or beat becomes recognized by the child through his own self-activity.

5. Corrective work. At this period the monotones can be treated in a special group, ear-training and individual help being given to those deficient in music.

Books of reference: Elliott's *Mother Goose;* L. and J. Orth's *Mother Goose;* Reinecke's *Children's Songs;* E. Smith's

Kindergarten Songs (Vols. I. and II); Neidlinger's *Small Songs for Small Singers* (in *Earth, Air and Sky* Series); Knowlton's *Nature Songs;* Hill's *Songs for Children,* Bentley's *Song Primer;* Hofer's *Singing Games* and *Popular Folk Games and Dances, Modern Music Series;* Primer, First and Second Book, Ed. Music Course, Ginn and Co. See *Teacher's College Record,* January, 1904: *The Teaching of Elementary Music* for fuller discussion of this subject.

INVESTIGATIVE PERIOD

First Step. Proceeding into the second period, songs become more and more the material for theoretical investigation on the part of the pupil. In this distinct stepping over, the esthetic element of song is pushed somewhat into the background. To avoid the dullness which usually creeps into singing at this point, the situation should be strongly reinforced with interesting, descriptive songs, which still retain their vital qualities.

Illustrations: *Patriotic Song,* Knowlton, a vowel study in *e* and in broad phrasing. Translate into pitch names. *The Woodpecker,* sustained singing and rapid enunciation — writing of phrases. *The Fireman,* vocal imitation of bell and whistle — study in pitch. *Wind-Song,* clear, ringing tone — illustrates use of chromatics, sharps and flats. *Squirrel's Thanksgiving,* rapid passages in crescendo and diminuendo—study in time and divided beat. *The Mill,* soft, vibratory singing — study in monotone and climax. *Primer* and *First Book* (Modern Music Series).

At this time more formal vocal exercises can be given and the range of voice extended, as it is now inclined to be most brilliant in quality. All singing should be light and carefully reinforced, with suitable breathing and physical exercises to avoid straining the fast-maturing vocal organs. The following exercises are suggested by needs of songs: viz., *Patriotic Song* and *Woodpecker* — deep sustained breath to support high tones. *Fireman,* expulsion of breath on "ding-dong;" *Mill-Song,* pouring breath on in steady stream; *Squirrel,* chasing tones with breath. Following these lines, vivid interpretation induces active bodily response on the part of the pupils and corrects bad position.

Advanced Step. Interesting songs with which to help advancing sight-singing at this period are the *Round and Catch,* the familiar folk-ditties known as *The Three Blind Mice* and *Chairs to Mend,* where a distinct melody capable of harmonic repetition is given. This is an excellent device for avoiding the "growling" of a second part, the usual attempt at alto singing without sufficient reading knowledge. These with the two and three-voiced canon make a natural and pleasurable approach to part-singing, and also show the development of the period and simple song form.

The simple classics on general subjects usually introduced into school-music books for this period here serve a good turn. Part-songs in thirds, sixths and octaves can be introduced in connection with these. The importance of part-singing can be emphasized by letting these middle grades sing an alto melody against the other parts in general school-exercises. Interest should be stimulated in general school-singing through the easier American, Scotch, Irish and German folk-songs, of simple emotional content and not too extended range. A list of these would include *Dixie, Kentucky Home, Tenting To-Night, Fir-Tree, Lorelei, Keel Row, Campbells are Coming, John Peel, Hunt Is Up, Wearin' of the Green, Canadian Boat-Song, Blue-Bells of Scotland* or *Santa Lucia.*

References: *Songs for Schools,* Farnsworth; *Songs Every Child Should Know,* Bacon; *Folk Songs,* Ditson; *Modern Music Series,* Second and Third Books; *One Hundred Rounds,* Boosey and Co.

CONSTRUCTIVE PERIOD

The next cycle of development includes the upper grades and the high school. The character of the work of this period is synthetic, aiming to unify the free investigation of the material of the previous stage.

First Step. From the study of rounds and easier part-singing the pupils should settle into steady and ready sight-singing. This material is easily supplied from the various school-music courses in short, bright choruses and glees, supplying practice in time and interval difficulties, harmonic and key changes. Rapid passages in thirds and sixths may be found in the gay folk-songs and in more elaborate musical compositions, found in the Modern Music Series, Third and Fourth Books; in *Songs of Life and Nature* by Smith; and in other music-readers.

Advanced Step. In order to teach the bass-clef, songs are given with the melody arranged for the boys in the bass, thus introducing them in a practical way to their own realm in music-reading. Pages 136, 150 and 168, Third Book, Modern Music Series, serve to illustrate. McFarren's *Harvest-Home* of this series is a very good illustration of the bass used as an accompaniment to the gay, bright obligato in the soprano. This can only be used where the boys' voices have changed.

Studies in harmony can now be carried forward through the analysis of the hymn and singing in parts. This will aid in the structural understanding of music. Examples used are *America;* the harvest-hymn and processional, *We Plough the Fields; A Mighty Fortress; Crusader's Hymn.*

HIGH SCHOOL

Music in the high school presents difficulties peculiar to this age. Change of voice, increasing self-consciousness, the uneven training and grading as to musical knowledge — all these make high-school work the most difficult and least satisfactory from a musical point of view. For ungraded classes the descriptive unison chorus, sufficiently mature to meet the advanced taste of the pupils, may be used. Among this list would be classed the more difficult national and patriotic songs: *Scots Wha Hae*, *Minstrel Boy*, *Marseillaise*, *Sword-Song*, *Fatherland Hymn*, Greig, and college and popular songs.

In a well-trained chorus having the brilliant quality of the soprano voices, altos chosen from the medium voices, with a sufficient power in the bass, the more elaborate school-choruses can be attempted in parts. Among these are the well-known favorites: *Soldier's Chorus* in *Faust*, *Pilgrim's Chorus* in *Tannhäuser*, *Spinning Chorus* in *The Flying Dutchman* and *The Heavens* by Beethoven, various selections from popular operas, descriptive and national music. The enlarged content of these demands increased vocal ability and power as well as a reading knowledge which is not usually found. *The Laurel Song-Book and Reader* by Birchard may be quoted for these. Where time and interest permit, a correlation with history and literature can be made through such noble songs as are here supplied. The Novello editions of national and folk-songs will also be found useful in illustrating Russian, Scandinavian, Eastern European and other national music.

GENERAL ASSEMBLIES AND FESTIVALS

To keep the spirit of music alive in the school there should be a continual oncoming body of song from all the grades. Anniversaries, national days, seasons and festivals should be the objective point of the musical programs of the year. Less time should be spent on uninteresting exercises for the elucidation of musical theory and more given to the preparation of *ensemble* material for the enjoyment of all. The standard literature of music in choruses, hymns, patriotic and national songs, selections from choral works, even the giving of cantatas, would fairly represent a *public-school*, not a college, course in music. It is not the function of public-school music to produce the finished artist, but to make for common standards of training in the democracy of art, of which our country stands in such great need.

MARI RUEF HOFER.

Schools, El'emen'tary. The conception of elementary education most agreed upon may be said to be that of training in literacy. Such a view refers, of course, to education given in the school as distinguished from that training in manners, morals and skill which is given in the home or by general social intercourse through imitation, apprenticeship etc. It covers the common element involved in those systems where elementary is simply preparatory to secondary education and those in which it is synonymous with popular education or such as is given to the masses. These two types have been differentiated and again united in history in such a manner that a sketch of the rise of popular education is almost indispensable to a comprehension of the problem of elementary education to-day. In the middle ages literary education was confined largely to the clergy and the professional classes. With them it was such training in Latin as would prepare them to understand the church services, legal or medical terms or to read the literature of theology, philosophy, medicine or law. Such training was not supposed to be necessary or even desirable for the mass of the people. The Reforma ion brought the idea that the Scriptures should be read by all, and also such translations as made it necessary to learn only the modern tongues in order to accomplish this purpose. Popular systems of education began to make their appearance. The Duke of Württemberg adopted a plan for vernacular schools in every village in 1559. This step was imitated by other German states, and in 1619 Weimar decreed that attendance on such schools should be compulsory f r the common people. In Holland the Synod of Dort in 1618–9 decreed that elementary schools should be established in every parish. In Scotland an effective system of parish schools was inaugurated in 1696. Massachusetts passed a law in 1647 providing that every town of 50 families should have an elementary school. In France a Catholic order, the *Brethren of the Christian Schools*, established in 1684 by Jean Baptiste de La Salle, emulated the activities of the Protestants in popular education. This order became widely influential, and is notable especially for its system of teaching children in graded classes rather than as individuals. In England it was not until early in the 19th century that two societies, the British and Foreign School Society and the National Society, began the work out of which the English elementary system of to-day has been constructed through the coöperation and, later, the supervision and control of the state.

In its beginning this popular education aimed at religious ends. It in general was very meager, being confined largely to religious instruction and some little training in reading and writing. The great revolutionary social and political movements of the 18th century may be said to have yielded their richest fruit in the reconstruction of these schools. Popular educa-

tion is essentially the achievement of the 19th century. It rests on the notion that education should be universal, that its aim is not merely religious, but rather to prepare for intelligent political activity, a purpose especially emphasized in the United States by Horace Mann, and that the emancipation of the mass of mankind demands not merely power to read and write and some knowledge of politics, but such training as shall insure to each the power to make a respectable if not comfortable living. The last idea may be said to be the special contribution of Pestalozzi, the Swiss reformer, to modern educational doctrine. He perhaps was the most influential man in determining the aims and methods that prevailed in the reconstruction of the system of education in Prussia and other German states in the early part of the 19th century. This movement involved the expansion of the curriculum to include arithmetic, geometry, geography, nature-study, literature, history, drawing, music and, especially, such manual and technical training as seems best adapted to prepare for the vocations of the people of the neighborhood. The eight or nine years' course in the German folk-school may now be supplemented by a course in the continuation-schools, held usually in the evenings or on Sundays and especially offering vocational instruction, or in technical or trade-schools which everywhere abound. Elementary teachers are usually well-trained in the normal schools. All schools have now become state institutions. No one can open a school without official sanction. Practically all elementary instruction is still supported and controlled by public authorities. Careful supervision and inspection exist. Teachers are pensioned on retirement from active service. Compulsory-attendance laws are strictly enforced. Illiteracy has practically disappeared, and efficiency in the various vocations has enormously increased through this system. In France the foundations of the present system were laid by the law of 1833, but it was not until after the Franco-Prussian War that it became highly efficient. The same features exist as in Germany, except that control and support are more highly centralized. The administration at Paris through its officials appoints the elementary teachers, provides their salaries as well as liberal contributions for buildings etc., and inspects the schools. During the last decade nearly all the schools maintained by Roman Catholic teaching-orders have been suppressed, so that elementary education, as in Germany, is practically in the hands of the state. At the same time the French schools, unlike the German ones, pay little attention to religion. In England, also, elementary education has become free and compulsory, supported largely by public funds, inspected and to a great extent controlled by state officials. The religious societies still control the training schools for teachers and many of the elementary schools. The dominance of the Anglican church in elementary education is a source of bitter contention to-day in British politics. As in other European schools, vocational efficiency has come to be a leading object in English popular education.

In the United States the free schools, at the time when Horace Mann undertook their reform (about 1835), were poorly supported and taught and not patronized by those who could afford to pay tuition. As a result of the agitation that he began, the public elementary schools of Massachusetts, hitherto supported solely by the localities, received state aid normal schools (*q. v.*) were established for training teachers, better inspection was provided, the school-year lengthened, the curriculum enriched, and in general the aim that the public school should be made so good that no one would resort to private instruction on account of their inefficiency was realized. Other states quickly followed Massachusetts, and to-day the opportunity to receive an elementary education is practically universal throughout the nation. In general it may be said that about 18 per cent. of the fund for the support of schools comes from the states, while about 68 per cent. comes from local taxes. The state-fund is especially important in sparsely inhabited regions. In New England the unit for the organization and control of schools is the township. In the south it is the county. Elsewhere in the nation the district as a rule is the unit, but a combination of district, county and state control and support exists.

In comparing elementary education in the United States with that in Europe, we notice that it is inferior in completeness of organization, in carefulness of inspection, in compelling attendance, in pensioning teachers and especially in offering technical and trade education. On the other hand American education offers more opportunity for originality and independence both in teachers and in pupils. The elementary school in the United States is not for one class in society but for all. It is not differentiated from the secondary school, but prepares for it as well as for life. Herein is to be found doubtless the reason for the slowness with which elementary technical education has developed. Such training prepares for a special vocation; but our system tends to hand that over to the secondary school, reserving for the elementary school only that preparatory and liberal training that enables one to get some appreciation of the various lines of human culture before entering upon a

course calculated to prepare for a trade, business or a profession. See EDUCATION, HISTORY OF; EDUCATION, MODERN; NORMAL SCHOOLS; SCHOOLS, RURAL and SCHOOLS, SECONDARY. E. N. HENDERSON.

Schools, Open Air, organized first in Prussia in 1904. The regulations vary, some schools taking normal, others defective or tubercular children, and providing entirely for them or merely following a regular school curriculum. The children study, play and recite out of doors even in very cold weather.

Schools, Rural, generally called *country* or *district* schools, meaning that class of schools found in agricultural regions or in communities having a scattered population. In the United States, the rural school is a public school, free to all children of school-age, (which varies in different states from four, five or six years to eighteen, nineteen, twenty or twenty-one years), of both sexes, residing within a defined territory—the school-district, township or county. In the southern states separate schools are provided for white and negro children. Special schools for Indian children are maintained on Indian reservations.

As ordinarily existing, a rural school is taught by a single teacher, in a building having but one school-room. It is in session from a few weeks each year in the poorly provided and less progressive communities to seven or eight months in the more favored and progressive sections of the country. The time of the year at which the school-session or term is held differs in different regions, being influenced by the character of the climate, quality of roads and occupation of the people. The number of pupils attending a rural school varies between the widest extremes. It is not an uncommon thing, in thinly populated reigons and in sections divided into many districts of small area, to find a school having but a half dozen or fewer pupils. Frequently, however, in the midst of a numerous population, or wherever the school supplies a somewhat larger area, a single schoolroom may serve for forty, fifty or sometimes close to a hundred pupils. Some states have enacted laws which make it necessary to build another school-room and employ another teacher when the attendance of the school reaches a maximum number, say sixty. Through consolidation of schools and the transportation of pupils a widespread movement is going on to decrease the number of small, poorly attended and isolated rural schools, and at the same time to encourage longer and more regular attendance of pupils. While the laws making the attendance of children between certain ages (8 to 14) compulsory, now in operation in thirty-six states and territories, are generally intended to apply to all children, irrespective of whether they live in city or country, for the most part no great effort is made to enforce these laws in the rural districts. The difference between city and country in this respect is shown in a striking manner by the fact that, while the average daily attendance of pupils in village and city schools is seldom below 90 per cent., that of the rural schools is most frequently in the neighborhood of 50 or 60 per cent.

The course of study of the fully organized rural school is usually eight years in length, and is composed of the recognized elementary or common-school subjects, — reading, writing, arithmetic, spelling, English grammar, geography, United States history, civil government, physiology and hygiene. Of recent years some of the more progressive states have added instruction in elementary agriculture, manual training and domestic science. Instead of being a graded school, that is, one made of pupils of nearly the same age and advancement, studying the same subjects together in classes, the rural school in the majority of cases is an ungraded school. In the smallest schools each pupil is a class by himself. In the large schools the whole number of pupils is divided into three or more groups for teaching. By law in most of the states all public schools must be taught in the English language, although in some sections of the country instruction is actually carried on in other languages; for example, in Louisana teaching in the French language is permitted in those localities where the French language predominates and in New Mexico in Spanish where that language is largely employed. While the typical rural school gives instruction of only elementary character, frequently secondary or high-school subjects are included. The establishment of rural and township high-schools and the consolidation of schools, particularly during the last decade, have greatly increased the opportunity of country children for a better and more advanced education.

Organization and Government. All of the public schools of each state are organized into a system. Every public rural school, then, is a state institution and, as such, falls to some degree under the control of a branch of the state government, which is usually presided over by a state superintendent of public instruction or a state board of education. In practice the actual control over any particular school is exercised by school-officers, elected by the people of the locality or chosen by the state educational officials. The local school-officers are known as school-boards, boards of school-directors, boards of education, school-trustees or county superintendents. The method of selection, the powers and the duties of these school-officers vary much in different states. However, it may be said that they act in general under the direction of a state-superintendent or a

state-board of education and under the authority of the laws governing schools passed by the state legislatures. These laws usually prescribe what school-officers there shall be for each school, when and how and for how long and by whom they shall be chosen, the amount of school-taxes to be raised and the manner of raising these, the length of the school-year, the age of pupils, the qualifications of teachers, the subjects to be taught etc.

The important fact to be kept in mind here is that every public rural school is a *state* institution, organized and governed in accordance with the general laws of the state regarding public schools. Though in many instances the people of the community exercise a large influence in determining the character and policy of the school, they are obliged, nevertheless, to act and proceed in the manner prescribed by the laws governing the public schools of the state.

Support. The best definition of a public school is that it is a school deriving its support entirely or in part from moneys raised by a general state or county or other local tax. The principle that all property and all persons may be taxed for the support of public schools may be called one of the most firmly fixed beliefs of the American people, and one that has aided more than any other in the giving of opportunity for education to every American boy and girl. Rural schools as public schools, with very few exceptions, are supported wholly by public funds.

Each state has its own particular plan of providing money to support its public schools. In the main this money may be said to come from one or more of five sources or according to one of five methods: the local school-tax; the state school-tax; the income from the common-school fund; special licenses and fees; and special state aids and appropriations.

The local tax is that levied annually upon the taxable property in any school-district, township or county. The amount of the tax is fixed either by the people themselves, as in the case of many school-district organizations; or by such school-officers as school-boards, school-directors or school-trustees; or by other local officials, as boards of supervisors and boards of commissioners.

The state school-tax is a tax, regulated in amount by the state law, levied by the state officers upon the taxable property in the state and distributed to the different counties, townships or school-districts, generally, on the basis of the number of children of school-age residing therein. Other methods of distribution, as, for example, valuation of property, school-enrollment, school-attendance or the number of schools or teachers, are also used, singly or in combination. Sometimes, as in California, a special state-tax is levied for the benefit of high schools alone.

The permanent school-funds found in most states were formed principally from the sale and rent of public lands that had been set aside for school-purposes. The income on these funds is alone used for the support of the schools of the state, and this income is apportioned to the various schools of the state according to methods similar to those indicated above for the state school-taxes.

In a number of states special forms of revenue are used to aid in the support of public schools. Among these may be mentioned liquor and other business license-moneys, inheritance-taxes, poll-taxes, dog-taxes, certain classes of fines etc.

The last source of support that may be mentioned relates to the appropriations derived from the state treasury in the form of special aid to particular classes of schools, as high schools, manual-training schools, rural and semirural schools, and to schools for which the ordinary means of support are found to be insufficient. These special aids or subsidies, as they may be called, are employed in several states to raise the general standard of public education by stimulating the attendance of pupils and to encourage the people to establish and maintain efficient schools of the kinds indicated. The system of special aids to rural schools is found in but few states, as for example, Wisconsin, Minnesota, Indiana and in some of the more progressive southern states for the special purpose of securing better school-equipment; yet the signs of the times are that it will soon be more widely used to improve these schools and thereby equalize the educational advantages open to the children of the country districts. The most important problem of the rural schools throughout the whole country is the devising of ways and means to increase the amount of support, so that these schools may be placed on a par with the public schools of the villages and cities.

Teachers. No person is permitted to teach in any public school of any state without having first received a teacher's certificate, which may be obtained by passing a written examination or by completing a course of study at a high school, normal school or college. In almost all of the states of the Union one or more normal schools for the special training of teachers for the public schools exist as a part of the educational system. Certain states require that high schools shall give instruction in those subjects that will be of special value to teachers. This provision has a direct influence upon rural schools, because in very many cases the graduates of high schools become teachers in the rural schools. In addition to the high schools, normal schools and colleges, there are numerous institu-

tions under private management with a similar aim. The supply of trained teachers furnished by the different high schools, normal schools and colleges scarcely more than equals the demands from the rapidly growing public schools of cities and villages. As a result of these demands, together with the better salaries and more attractive life in cities and villages, few trained teachers are found in the rural schools. Generally speaking, the great majority of rural school-teachers are young women without any special education to fit them for teaching beyond that provided in the schools they teach or, at the best, by a neighboring high school. In this respect the most of rural schools are not provided with teachers of sufficient skill and training to do the important work to be done. The low and insufficient salaries paid and the uncertainty of securing and holding a situation tend to make the rural teachers' position a hard one. Of recent years some of the more progressive states have established special county-schools for the training of teachers for the rural schools, and others, as Ohio, Pennsylvania, Indiana, Maryland, North Dakota and West Virginia, have also passed minimum-salary laws. Under these laws every public-school teacher must be paid at least a certain monthly salary ($40 to $45), and no board of education or school-district may pay a smaller sum. The question of obtaining trained and expert teachers is the second large and important problem yet to be solved.

Buildings. The old-fashioned, country school-house was constructed of logs, rough lumber, stone or, in some of the prairie-states, even of sod. It contained one oblong-shaped room, about 20 feet wide and 30 long, was heated by a fire-place or stove, and was furnished with rudely made desks and benches for the pupils. It was oft-times very poorly lighted and generally cold in winter and hot in summer. Very little was thought of ventilation and fresh air. Instead of being the best-built and neatest-looking building in the community and surrounded by well-kept grounds, it was more apt to be unpainted and dilapidated in appearance by its broken shutters and windows. In the larger number of cases it was located on the most exposed or least desirable piece of land in the district; hence the school-house surroundings were altogether barren except for the tangled growth of weeds that sprang up during vacations. As one drove through the country the school-house could frequently be picked out as the worst and most doleful-looking of all the buildings. Many of the farmers' barns looked neater and more inviting. Unfortunately many thousand country-school pupils still go to school in buildings of this kind.

However, a great change is taking place, and all over the United States new structures are being built for the rural schools, which are properly and sufficiently heated, ventilated, lighted, provided with furniture and apparatus for school-work and surrounded by shade-trees and neatly kept grounds. It is coming to be recognized that the "little, red school-house" of olden time lacked many things necessary to the health, comfort and progress of pupils and that the pupils of the rural schools are entitled to as good, healthful, useful and beautiful school-buildings as the pupils of the village and city schools. To encourage the erection of better school-buildings in the rural sections a number of states now offer special aid in the way of additional funds. To provide against poorly constructed buildings it is becoming a common practice to require, before any rural school-building is erected, that the plans for it shall be approved by some competent county or state educational officer For the information of parents, teachers and school-boards many states have issued books of plans of model buildings and pamphlets giving in detail the requirements that should be fulfilled, that a child may attend school and not be under unhealthful conditions.

Improvement of Rural Schools. During the past decade many efforts have been made to improve the character of the rural schools, and at present these schools are receiving more attention from the people concerned and from educators, legislators and public men than ever before. That these schools deserve such widespread assistance and improvement is evident. In the main the rural schools are the weakest and least satisfactory, yet at the same time the most important, part of the American public schools. Though exact and reliable statistics are wanting upon the number and attendance of these schools, certain conclusions can be drawn indirectly. In 1905 there were approximately eighty-two and one half millions of people in the United States, of whom somewhat more than half lived in rural districts. During this year there were enrolled in all the public elementary schools of the country nearly sixteen million pupils. It is safe to assume that in the neighborhood of half of these sixteen million pupils attended rural schools. These eight million country-school children are entitled to an opportunity for a complete education equal in degree to that provided in the public schools of the cities and towns. The difficulties to be overcome are many, yet the following movements and reforms are well under way. The first results seem to indicate that the boys and girls who are pupils in rural schools are to have a chance to become really educated men and women; not educated away from the home and the farm but *for* the home and the farm.

Consolidation of Schools and Transportation of Pupils. Just when this reform had its first beginnings is difficult to say; in all probability in Massachusetts where the first law relating to the transportation of pupils to school was passed in 1869. The first experiment of centralizing schools and transporting pupils of which there is any reliable account was made by the school-officers of Quincy (*q. v.*) in 1874–5. From Massachusetts the movement spread slowly into other parts of New England and gradually found recognition in the central and western states — Ohio and Indiana being among the first to accomplish definite results — until no less than 20 states have passed laws permitting the consolidation of schools and the transporting of pupils to a larger central school.

In operation the plan of consolidation and transportation is usually somewhat as follows: The separate, small, one-room ungraded schools within a certain territory are closed, and at some convenient, central spot a suitable new building is constructed of a sufficient number of rooms to accommodate all of the pupils residing within the territory of the closed schools. Even though the new school is centrally located, it will very likely be at too great a distance from the homes of many of the pupils to permit them to walk back and forth to school. The difficulty is met by using wagons to transport the children directly from their homes to school in the morning and back in the evening. The best wagons are constructed after the manner of omnibuses, with covered tops and sides and with two long seats running lengthwise, so that the children enter and leave by a rear door. In cold weather the wagons are heated by small coal-stoves placed near the driver's seat, which also is partially enclosed. Each wagon travels over a definite route, seldom more than five or six miles each day, and conveys from 16 to 20 pupils. Sometimes the wagons are owned by the school-district or the township. More frequently, however, a contract is made with private individuals who furnish wagons, horses and drivers. Frequently similar purposes are accomplished without consolidation in the strict sense. In the case of small district-schools in the vicinity of villages or cities the schools are merely closed, and the pupils are transported as described above to the schools of the village or city. In such instances the cost of tuition is paid by the school-district or township from which the pupils come, many states having made legal provision for this as well as for paying for the transportation.

By the plan of consolidation and transportation, or transportation alone, some of the greater hindrances to education in the rural school, as irregular and unpunctual attendance, poor and unhealthy buildings, insufficiently prepared teachers and absence of proper grading of pupils, — are done away with. Under these plans pupils are enabled to attend school more regularly and punctually and for a longer period of years; better school-buildings, properly heated, lighted, ventilated and equipped, are provided; fewer teachers are needed for the same number of pupils and, with the better salaries possible, more capable teachers are secured. The larger number of pupils in the consolidated school makes it possible to grade the school to better advantage by placing pupils of similar age and advancement in the same classes. Each teacher teaches but one or two classes; hence the work of each class is done more thoroughly and the pupils make more rapid progress. Besides these important advantages the consolidated rural school frequently is able to give the privilege of a high-school education to those pupils who are properly prepared. The experience in states where the plans have been carefully tested indicates that the cost of the consolidation and transportation, or of transportation alone, is but little if any more than education under the old plan. Indeed, very frequently it is considerably less. In fact, it would seem as if the plan offered a way out of a great difficulty, and if the people of the rural communities were to take advantage of them, many thousand country-boys and girls would be able to obtain an education equal to the best that the American schools are able to give.

Conventions of School-Officers. In order to make school-officers, as members of district and township school-boards, better acquainted with their official duties and to increase the general interest in the welfare of the public schools, especially the rural schools, a few states have begun the practice of having these officers in each county meet together once each year. At these conferences, or conventions as they are called, matters of importance are discussed by the members themselves; frequently one or more of the state's educational officers are present to aid in the spreading of information about better schools and how to secure them. Five states, — South Dakota (1901), Minnesota (1903), North Dakota (1903), Pennsylvania (1903) and Wisconsin (1905) — have enacted laws which provide for the paying of the expenses of the school-officers attending the meetings. Before all the children of the rural districts can have the chance of attending good schools, all of the people must be made to feel the need of having such schools. The school-board convention will probably be of great service in the accomplishment of this.

Rural High-Schools. The ordinary rural school is one in which instruction in elementary subjects alone is given. For many

years many of the people of the rural districts have wished that their children might have the same kind of opportunity to attend high schools as the children of the cities have. This has been brought about in many cases by establishing county and township high schools, attendance at which is free to any pupil residing in the county or township, and by providing for the free attendance of country pupils at the high schools of neighboring cities and villages, the school-districts from which the pupils came paying the cost of tuition. A few states have already established county-schools of agriculture and domestic science for those boys and girls who have completed the work of the ordinary district-school. This movement to give a high-school education to country pupils is one of the most important reforms of the present time. So important, in fact, is it that a plan to have the national government make special appropriations for the support of these schools has been prepared and considered by Congress.

Educational Extension. In addition to the efforts to improve and enlarge the opportunity for the education of the pupils of rural communities in *schools*, numerous other plans have been put into operation to give *all* the people of these communities, men and women as well as children, a better chance to become educated. In this connection may be mentioned the placing of libraries in the rural schools; the establishment of the system of traveling libraries; the holding of farmers' institutes; and the forming of farm-clubs, including not only the pupils of the schools but those older boys and girls who have left school for any reason, in order to create a lively interest in the betterment of the crops of the farm. When all these things happen to the rural schools, it may be truthfully said that every American country-boy and girl has the best educational privileges of any boy or girl in the world, and life on the farm will be better than any other life. But not until then.

Bibliography. Of recent years there has appeared in various educational publications and reports and in periodical literature a large amount of material on rural schools. The following brief list gives the latest and best publications upon the rural schools accessible to the ordinary reader: National Educational Association's *Report of the Committee of Twelve on Rural Schools* (1895); *Report of the Committee on Industrial Education in Schools for Rural Communities* (1905); Kern's *Among Country Schools* (1906); Johnson's *The Country Schools* (1907); and Corbett's *Free High Schools for Rural Pupils* (Report U. S. Com. of Ed. 1899–1900, pp. 643–662).

E. C. Elliott.

Schools, Sec'ondary, of to-day may be said to have originated from the Renaissance. At that time there developed in the aristocracy of Europe an interest in polite social life that found satisfaction in a study of the culture of Greece and Rome and especially of classic literature. The secondary schools sprang into existence, having for their aim liberal culture, or culture in the humanities, as distinguished from the religious or spiritual instruction given in the middle ages. They may be typified by the *gymnasia* of Germany; by the so-called "public" schools and the grammar-schools of England, most of which are endowed; by private institutions like that of Vittorino do Feltre in Italy; and by the great system of colleges established by the Jesuits all over Europe. In general they gave a course of from eight to ten years devoted almost entirely to the Latin and Greek languages and literatures. Hebrew was occasionally given, and also a little history, with possibly mathematics, logic and ethics, but these subjects were learned almost entirely through classical texts. The development of modern literature and the disappearance of Latin as the language of science and learning rendered this program somewhat antiquated, but it has to a great extent been retained in the classical secondary schools on the ground of the discipline it is supposed to furnish. (See Mental Discipline.) On the other hand, other types of secondary schools have sprung up, laying stress on modern languages, history and science. In Germany the secondary system of to-day comprises the classical school or *gymnasium*, giving a nine years' course, the scientific school or *realschule*, the course of which is the same in length or shorter, and various intermediate types. The curriculum of the *gymnasium* includes religion, German, Latin, Greek, French, history, geography mathematics, natural history, physics, writing and drawing. The *realschulen* leave out the classical languages and emphasize science and mathematics. In France the colleges of the Jesuits disappeared because of the suppression of the order in 1764. In their place *lycées* and communal colleges have been established. They offer a nine years' course, the early part of which is like that in the German *gymnasium*, but during the last three years the pupil can elect to specialize either in classics, modern languages or science. In England the endowed schools were subjected to a careful state investigation about the middle of the 19th century. The result was the disappearance of many abuses, somewhat better organization and a few steps toward modernizing the curriculum. They, however, remain to-day almost entirely devoted to the classics. Mathematics, history and science are taught, but the historical and scientific instruction is very meager. On the other hand, the

English have come to denominate as secondary education, work in sciences, technology and art now given quite extensively as a supplement to the instruction in the elementary schools. In all these typical secondary schools the ordinary age of admission is nine or thereabout. Children are taught before this age in small private schools or by tutors. Very few go from the public elementary system into the secondary schools. The latter remain, therefore, as throughout history, the schools of the aristocratic and professional classes.

Here it is that the system of the United States has come to differ from that of Europe. For the secondary schools in this country are simply one stage in a continuous system. This result has come from gradual growth, for in the beginning American secondary schools were very much like those of Europe. In colonial days they consisted of grammar-schools, which had about the same purpose and curriculum as the English grammar-schools. Especially were they intended to prepare for college. Later they were largely superseded by the academies, which were under private control, although often endowed. These institutions became centers of educational life in various communities, and besides preparing for college better than grammar-schools had done, they constituted finishing-schools for most of those who attended them. Some of them grew into colleges. Their curriculum came to be much more liberal than had been that of the grammar-schools. English, including grammar and, later, rhetoric and literature, geography, natural philosophy, astronomy and, sometimes, chemistry and botany, algebra, geometry, trigonometry, surveying, navigation and history; and, later, modern languages and commercial branches, as well as the classics, were taught. The academies remain an important factor in the education of the United States, but they have been overshadowed by the high schools, the development of which is due to the growth of the idea that secondary education should be supported and controlled by the public. The first of these schools was established at Boston in 1621. Since then they have spread over all the Union, to-day numbering nearly seven thousand. They are supported and controlled by the local communities where they exist. Most of them are coëducational. The course of study usually takes four years, and pupils enter at about 14. As a rule the student may elect among several courses, which are denominated, according to the leading subjects of study in each, as classical, literary, scientific, Latin-scientific, modern-languages or commercial. In recent years there has been some agitation concerning the length of the high-school course. Some would have it cover six years, embracing the work of the last two years in the elementary schools. Others would have it encroach on the college; and graduate, high-school work is actually undertaken in some places, especially where the local facilities for college education are poor. The high schools have been compelled to do very efficient work in college preparatory subjects by the pressure of college demands. In many states, especially in the west — they are inspected by the university authorities, and, if found satisfactory, their graduates are admitted to the university without examination. Thus a system of inspection has grown up, the main one found in the United States for secondary schools. The complaint has become general, however, that high schools are dominated too much by the colleges, so that they aim merely to prepare for the latter and neglect the interests of that vast majority who do not go to college. To-day the tendency is for the high school to become more independent, even to the extent of compelling the college to accept *their* standards of graduation as qualifying for entrance. Many high schools have been organized to give technical or commercial education. In most cases, however, these schools have simply added the vocational training to a fairly liberal, secondary-school course. Future developments in secondary schools will doubtless comprise far more adequate provision for technical and trade education. In general it may be said that the high school is in a difficult situation, struggling on the one hand with its tradition of classical, disciplinary and aristocratic education and on the other with the democratic demand that it should provide a secondary education suitable for all, taking its students from an independent elementary system and coerced by the need of preparing them for college. It is coming to realize that the solution lies in more independence both in regard to tradition and to other schools. See EDUCATION, MODERN; MENTAL DISCIPLINE; SCHOOLS, ELEMENTARY; and UNIVERSITIES.

E. N. HENDERSON.

Schools, Sum'mer. Schools of the Chautauqua type are held only during the summer months, at favorable resorts, and combine study with recreation, although opportunity is also offered for advanced instruction in special branches. Among summer schools and universities, that of the University of Chicago is unique in having the regular work of the entire university carried through the summer quarter. The universities allow credit towards a degree for work done during the summer session. Another important type of summer school is that for the professional training of teachers. There are also summer schools for the pursuit of some branch of natural sciences located at places suitable for their particular purposes.

School System at Gary, Ind. The rapid growth of Gary and the character of the population attracted by its gigantic industrial enterprises created an educational problem of uncommon difficulty. In the effort to provide suitable and sufficient educational facilities and have these keep pace with the needs of the city there has developed a school system having certain features which are essentially new. As is usually the case, this response to an emergency has taught lessons of value to schools everywhere, hence the widespread interest which this school system has aroused.

THE MAN WHO DEVELOPED THE SYSTEM

The man under whose leadership the system has been built up within the short period of seven years is Superintendent William A. Wirt. The essential features of the plan of organization and administration had been thought out by him and partly applied while he was superintendent of the schools at Bluffton, Indiana. The success of the plan there and its special fitness for conditions which would have to be met in the building of Gary led to his selection as the one best fitted to build its school system.

"UNIT SCHOOL PLANTS"

Best results, under this system, are attained in what are designated as "complete unit school plants." It is essential that a "complete unit school plant" be located adjacent to or near a city park. The school building must be situated on grounds containing ten to twelve acres. Within the building, besides class-rooms, there must be an auditorium, gymnasiums, swimming pools, work shops, laboratories, studios, libraries, and all the facilities for comfort and convenience with which modern school buildings are now constructed. Outside the building there must be playgrounds and school gardens.

FOR ADULTS AS WELL AS CHILDREN

Thus situated and arranged, the "unit school plant" is a "complete" recreational as well as an educational center for a section of the city—for adults as well as children. In the daytime it is a "complete" school, having all of the grades—kindergarten, elementary, and high school. In the evening it is a "complete" center for social, recreational and continuation school purposes. On Saturdays it is a "complete" opportunity for voluntary work, play, and for pupils who need special help in order to keep up with their classes. In the summer time it is a "complete" center for vacation school purposes.

Ideal centers are represented by the Emerson and the Froebel plants. When operated in accordance with programs which are described below the capacity of these plants is 2700 pupils each in the day time and an equal number of adults in the evening. This capacity is secured by grounds and buildings of unusually generous porportions and by programs which utilize continuously every part of the building.

PROGRAM SHOWING HOW SIXTEEN CLASSES ARE ACCOMMODATED IN A BUILDING HAVING EIGHT ROOMS

REGULAR STUDIES		FORENOON		AFTERNOON	
Teachers	Rooms	90 Min.	90 Min.	90 Min.	90 Min.
First Grade	Classroom	1a	1b	1a	1b
Second Grade	"	2a	2b	2a	2b
Third Grade	"	3a	3b	3a	3b
Fourth Grade	"	4a	4b	4a	4b
Fifth Grade	"	5a	5b	5a	5b
Sixth Grade	"	6a	6b	6a	6b
Seventh Grade	"	7a	7b	7a	7b
Eighth Grade	"	8a	8b	8a	8b

SPECIAL ACTIVITIES								
Teachers	Rooms	45 Min.	45 Min.	45 Min.	45 Min.	45 Min.	45 Min.	45 Min.	45 Min.
Music & Literature	Auditorium	1b	2b	1a	2a	3b	4b	3a	4a
Drawing & Man. Tr.	Basement	3b	4b	3a	4a	1b	2b	1a	2a
Music & Literature	Library	5b	6b	5a	6a	7b	8b	7a	8a
Nature Study	Basement	7b	8b	7a	8a	5b	6b	5a	6a
Three physical culture teachers and the Building Principal	Attic	2b	1b	2a	1a	6b	5b	6a	5a
	Playground	4b	3b	4a	3a	8b	7b	8a	7a
		6b	5b	6a	5a	2b	1b	4a	3a
		8b	7b	8a	7a	4b	3b	2a	1a

"REGULAR STUDIES" AND "SPECIAL ACTIVITIES"

The old program followed with various modifications in all schools which do not have large auditoriums, is so arranged that half of the pupils give half of each forenoon and afternoon session to "regular studies," followed by an equal amount of time given to "special activities." The other half of the pupils have the same program, but in reverse order. The "regular studies" are the formal language studies (reading, writing, spelling and composition), arithmetic, history and geography. The "special activities" are music, literature, drawing, manual training, nature study, physical training, play, voca-

tional work, etc., varying in character and degree according to pupils' needs.

A CITY WITHOUT SPECIAL SUPERVISORS

The "regular studies" and "special activities" are conducted continuously throughout the day, by special teachers, on the departmental plan. There are no supervisors, as in other cities, aside from the superintendent and principals. The superintendent believes that teachers giving instruction in a limited number of subjects, for which they have been specially trained and selected, makes any overhead charge for their supervision, beyond that of the superintendent and principals, an unnecessary expense. Moreover, the character of the daily program, with the scheme for alternating classes in "regular studies" and "special activities," whereby all parts of the plant are used throughout the day, practically doubles the plant's capacity. Program on preceeding page shows how sixteen classes are accommodated in a building of a common type having eight class rooms.

The new program, now operated in the "complete" centers and requiring a large auditorium, is formulated in accordance with the following scheme:

HOW WORK OF PUPILS IS DIVIDED

The daily work of all pupils is divided into four different lines. One line of work is conducted in ordinary class rooms; a second in the shops, laboratories and studios; a third in the auditorium; a fourth in the gymnasium, swimming pools, play rooms or on the playgrounds. These lines of work are indicated below as Departments 1, 2, 3 and 4, respectively.

change departments and are engaged as shown in the diagram, and so on throughout the day.

For illustration we will limit ourselves to the work of pupils in the grades, although the same general plan of distribution applies, with necessary modifications, to pupils who are in high school.

With this simple arrangement two schools are accommodated in the same building, one school working in two of the departments while the other is occupied in the other two departments, alternately thus engaged throughout the day.

CHARACTER OF SPECIAL ACTIVITIES

In all grades the time assigned to Department 4 is divided between the teachers of physical training and play and teachers of subjects listed under Departments 1 and 2. In the lower grades teachers of mathematics, history, etc., use their share of this time, one hour, in games and constructive plays that apply the subject matter taught in the regular classes. This period is definitely planned to give the formal work of the school expression through self activity.

Music and literature teachers use the application period for folk dances, musical games, dramatization, modeling in clay and sand, and free play construction in the "busy corners" of the playground or play rooms. Nature study teachers use this application period in the care of lawns, trees, shrubbery, plants in the building and gardens, animal pets, etc. In the upper grades mathematics teachers use this period for practical measuring and planning of buildings, laying out playgrounds and spaces, and in practical accounting in connection with the clerical work of the school, and so on.

TABLE SHOWING HOW WORK IS DIVIDED

TIME	DEPARTMENT 1	DEPARTMENT 2	DEPARTMENT 3	DEPARTMENT 4
	Language Mathematics History and Geog.	N. Study and Man. T. Domestic Science Draw. and Music	Auditorium (Mass instruction)	Phys. Tr. Play Application
8:15 - 9:15	A	B	....	C D
9:15 - 10:15	B	A	C	D
10:15 - 11:15	C	D	A	B
11:15 - 12:15	D	C	....	....
12-15 - 1:30	A	B	....	....
1:30 - 2:30	B	A	D	C
2:30 - 3:30	C	D	B	A
3:30 - 4:30	D	C	....	A B

Four groups of pupils are simultaneously engaged in these four different departments throughout the day. For example, one group of pupils in Grades 1, 3, 5, 7, indicated as Group A above, is occupied with Department 1 of the first hour. A second group of pupils in Grades 2, 4, 6, 8, indicated as Group B, is occupied with Department 2. The third and fourth groups of pupils (Group C, Grades 1, 3, 5, 7, Group D, Grades 2, 4, 6, 8) are thrown together this first hour and are occupied with Department 4, this first hour, there being no exercises in Department 3 during this period. The second hour these four groups of pupils

In the lower grades the occupations of the application period are based on the play impulse and are conducted out of doors, in the spacious corridors, or in the play rooms.

Observe that under the new program half the school is at lunch from 11:15 to 12:30, and the other half from 12:15 to 1:30, an arrangement which is very desirable where there is a large number of pupils in the building.

INTERESTING POSSIBILITIES OF THIS PROGRAM

There are many interesting possibilities under the new program. For example, one-half of the school (the C and D groups) or

individual pupils in these groups, need not come to the building until 9:15, and the other half of the school (the A and B groups) or individual pupils in these, could be excused at 3:30, if this seems to be the most desirable arrangement for entire groups or for individual pupils. Again, a part of the time assigned to Department 4 could be utilized in other ways than those indicated. Classes in each group could give one period or more per week to religious instruction under the direction of the various churches or other religious organizations in the city. This plan is being tried by Superintendent Wirt as a means of solving the problem of religious instruction. Or, if desirable, the classes in each of the groups could spend one or more periods per week in the public library in charge of a regular teacher and a library assistant. This plan also is being tested. In such ways as these the purpose is to unite with the school all of the other available educational or recreational resources.

VOCATIONAL TRAINING WITH WORKMEN AS TEACHERS

The plan for vocational training in the Gary schools has attracted much attention, and consists in having a number of regular workmen selected on account of their upright character, intelligence, skill and teaching ability, engaged the year round in equipping and repairing the school plants of the city, pupils working with them in somewhat the same way as the old time apprentice. There are carpenters, cabinet makers, plumbers, sheet-metal workers, engineers, printers, electricians, machinists, foundrymen, etc., in sufficient number to meet the needs of the schools, and instead of employing a large number of these to put things in shape during vacations, as is done in other cities, this city, which has no long vacations, employes a small number and keeps them continuously engaged. Book-cases, cabinets, pupils' desks, benches, etc., are made, and these require staining and finishing. Some of the buildings or parts of buildings are to be painted inside and out, and there is always plenty of varnishing to do. Interior finish of buildings and desks and furniture have to be done over from time to time, and so on. The engineer of the heating, lighting, and ventilation plant gives lessons in firing, engineering, and ventilation. The electrician must care for many motors, lights, bells, clocks, etc., and here are opportunities for teaching and learning winding, motor construction, etc. The printing plant offers opportunities for both boys and girls in printing, making note books, repairing and rebinding of books, etc., and cuts for illustration, involving photography and photo-engraving, are to be made. Plumbing must be installed and kept in repair, and numerous parts of the school equipment call for the sheet metal worker. The foundry and machine shop are necessary, and these call for draftsmen to furnish plans and specifications. Moreover, in the purchase, care, and distribution of a great variety of supplies there is a laboratory for giving insight into commercial and business methods, calling for clerks, stenographers, bookkeepers, filing of correspondence, and making office reports, etc.

HOW "BUSINESS" BEGINS AT 8 O'CLOCK

As one observes the school in operation he discovers various special arrangements now to be mentioned. Arriving at the plant soon after 8 o'clock in the morning, the visitor will find that children are already to be found in every part of it. They are busy in playgrounds and gardens; they are hurrying to and fro in the corridors, as is the case at the time of passing from "regular studies" to "special activities" during the day. Since the same rooms are used by different groups in the evenings and on Saturdays, as well as during regular school day periods each pupil must have a locker where he may keep his belongings needed during the whole round of his daily occupation. Much of this passing, therefore, is occasioned by pupils returning things to the lockers or in taking from them something necessary for the exercise which comes next.

A PECULIAR KIND OF DESK

In some of the rooms used by pupils in the lower grades you find a peculiar kind of desk constructed by workmen in the industrial department with the aid of pupils. They are desks readily convertible into work benches, having detachable tops to serve as drawing boards. Instead of the usual type of seat attached to the floor or to the desk immediately behind it, each desk is provided with a substantial four legged stool, also made by the school, and this may be pushed under the desk when pupils do bench work.

A SCHOOL LIFE OVERFLOWING WITH EAGER ACTIVITIES

In the shops you will find pupils working at something in which they have become deeply interested. Or, if you glance into the auditorium several times during the day, you will find groups of children engaged in dramatization, singing, listening to the Victrola or piano player, looking at the stereopticon or moving pictures or attending to illustrated talks. In the corridors you find them studying and making notes on charts, maps, specimens, and other material exhibited there. In the laboratories some are working, others watching, older pupils "showing" the younger, or instructors conducting a regular class exercise Many girls in the advanced grades, aside from learning how to become intelligent homemakers, are occupied in the commercial and printing departments; some are at work in the arts and crafts; others in the school store and school bank, these two adjuncts being an actual business department, run according to strict business principles, to give reality to commercial studies.

In the "regular studies" you readily discover that in spite of departmental teaching, the

various special teachers are doing team work. In a word, you find a correlation of studies and activities.

HOW MONEY IS SAVED UNDER THIS SYSTEM

The system provides for the better use of school buildings, making it possible to save large sums of money expended for this purpose, the buildings being so arranged that they may be used day and evening, including Saturdays, the year round. It would require considerable space to give the proof of this statement in detail, but it is clearly obvious that the erection of a number of unit plants, such as the Emerson and Froebel, is less expensive than the erection of a large number of buildings of the usual kind. The cost of building construction does not increase in proportion to the size of building, materials used and facilities offered remaining the same, to say nothing about the cost of fewer sites. Moreover, the establishment of school plants, so constructed as to utilize what is ordinarily waste space or space which is used only part of the time, according to a program which uses all parts of the buliding all of the time, makes it possible to double the plant's capacity. There is also a saving in expense for equipment by installing it in a few as opposed to many centers. Furthermore, the special activities under the new form of program are conducted in parts of the plant which are less expensive, on the average, than regular class rooms, and if there were not this alternation of classes engaged in regular studies and special activities, it would be necessary to double the number of regular class rooms, so that each pupil might have a desk and the use of a cloak room. It is equally obvious that the cost of operation and maintenance is decreased by having the necessary number of unit centers as compared with the usual practice elsewhere. The figures clearly show this. The expense per pupil for janitor service, principal, and for instruction, with the overhead charges for supervisors eliminated, is materially reduced.

The system also provides the possibility of a better division of time between the old and the new studies, spoken of throughout as "regular studies" and "special activities," and there is greater flexibility in adapting studies to exceptional children of all kinds, thereby doing away with the necessity of numerous special schools. The system also makes it possible to have more expert teaching by reason of its departmental plan of organization, while the better use of play time and the long school day prevents influences of the street and alley which undo the work of the school.

There is also more realism in vocational and industrial work when under the direction of expert workmen from the ranks of laboring men having charge of real shops, which pupils pass from day to day, and in which sooner or later they get their first lessons in some trade industry.

HEALTH, MORE RAPID ADVANCEMENT AND OTHER ADVANTAGES

It is also clear that the system has unsurpassed facilities for the promotion of the health of children, and the possibility of having pupils do work in more than one grade and of promoting them by subjects instead of grades, gives to this system an advantage over the traditional form of organization with its "lockstep" system of gradation and promotion. In this system there is also provision for pupils to help each other. The chasm between elementary and high school is destroyed, and dropping out of school at critical periods in the lives of pupils is prevented by the introduction, at such times, of subjects which appeal to awakening interests which are not satisfied by a continuous and exclusive devotion to the "common branches."

BETTER SALARIES AND FEWER PUPILS PER TEACHER

It is also clear that under this system it is possible to pay better salaries to teachers or reduce the number of pupils per teacher or both, and to bring together in a unitary way, with economy and efficiency in management, the other recreational and educational agencies of a city.

ADAPTATION TO OTHER CITIES

Buildings of the old type can, with varying degrees of success, be adapted to the new program, and the system as a whole is adaptable to other cities. The alteration of buildings demanded by the Gary program would practically double the school accommodations. Or, a city which already has class-rooms enough to care for all of the pupils, with a desk for each, could, by the adoption of the new plan, dispose of about one-half of its sites and buildings, the less desirable, of course, for more than enough to remodel and equip the remaining school facilities for use when operated under the program now followed at Gary in the complete unit school plant. A change to this system would involve a reassignment of teachers according to the departmental plan. Some of them, if retained in the service, would have to enter upon courses of training for some special work according to individual interests and aptitudes. Some unfitted for working in the new spirit would have to be retired. The number of principals would be diminished; supervisors would become teachers of special activities in centers, giving all their time to this work instead of spending much of it in going from building to building, breaking into programs of class room teachers at all hours of the day, and giving lessons while regular class room teachers look on. Thus reorganized, these centers would become fitted for the wealth of opportunities afforded by the Emerson and Froebel school plants; not so well suited as plants originally designed for such opportunities perhaps, but, nevertheless, well adapted to these ends.

WILLIAM P. BURRIS.

Schools for Defectives. The course of modern education in the teaching of defectives furnishes an admirable illustration of the law first emphasized by Spencer in his classic essay on "Progress"—the germ and beginning of his great elaboration of the evolutionary process. He points out that every cause produces more than one effect. And "every tree bringeth forth fruit after its kind"—the good tree good fruit, the evil tree evil. As a consequence when you start out to accomplish one good object you inevitably—if you succeed—accomplish more than one.

ORIGIN OF THE MONTESSORI METHOD

In accordance with these laws of growth it was in her work in an institution for the feeble minded that Dr. Montessori (*q. v.*) unconsciously began the development of the remarkable system of education which bears her name and which seems destined to hasten such vital changes in our teaching methods.

HOW DEFECTIVES ARE CLASSIFIED

Defectives include the deaf, blind and feeble-minded or idiotic. It is only within 60 or 70 years that much attention has been given to their education, but in special schools in this country and in Europe the majority become self-supporting—particularly the deaf and the brighter ones of the feeble-minded.

EDUCATION OF THE DEAF AND THE BLIND

In the case of the deaf the chief difficulty is to teach them the use of language without the aid of sound. For this purpose the three chief methods that have been used are that of *sign-language*, in which a separate sign is made to represent each different object or idea; that of the *manual alphabet*, in which our ordinary letters are symbolized by signs made on the fingers; and *the direct, intuitive or oral method*, in which the pupils learn to understand oral language and to speak it by watching the movements of the teacher's lips in speaking and by imitation of the movements of the vocal organs. The oral method is difficult, but in many cases excellent results have been secured by it. Most schools use a combination of several methods. Among private schools for the deaf the Wright-Humason School in New York is one of the best.

The first American schools for the blind were those of New York, Boston and Philadelphia, established about 1833, in each instance through private capital and enterpise. It is very important that the teaching of blind children should begin at an early age, lest the natural development of the mind be hindered through lack of activity Here, also, various methods of teaching have been employed. Reading from embossed print has now been largely superseded by an alphabetical system of dots instead of letters, devised by the blind themselves. This system is easier to read by touch and easier to write than the letter-system. Recent inventions have made possible the rapid production of whole libraries for the blind in this latest *braille* system. The National Printing House for the blind at Louisville, Ky., keeps a large supply of books on hand. The task of teaching the blind is much easier than that of teaching the deaf and dumb.

There have been some remarkable instances of the successful teaching of the deaf-blind, particularly the cases of Laura Bridgman and Helen Keller.

Of the feeble-minded there are all varieties and gradations, and some can be helped or entirely cured by proper surgical treatment. They should always be separated from the insane. Some are incapable of much instruction and cannot be made self-supporting. In general the feeble-minded person lacks initiative and controlled and purposive action. Industrial and kindergarten training are each found very valuable for all classes of defectives.

Schools of Com'merce. Commercial education in the United States is conducted by four classes of institutions: private business and commercial schools; public high schools; endowed schools, which often have an industrial as well as a commercial bias; and colleges and universities. The need for special commercial education increases with the complexity of modern business methods. It is felt in the secondary more than the primary school. Elementary education is much the same for all; but the secondary school may tend to prepare exclusively for the college and not for a business vocation. The need of secondary commercial schools was met by their establishment in Vienna as early as 1754, in Brussels in 1834, Trieste 1877, Leipzig 1898, Aix-la-Chapelle 1900, Cologne 1901, Frankfort 1901, Milan and Lorraine 1902. In 1904 the enrollment at Cologne showed 778 students, at Frankfort 546 and at Leipzig 395. A higher commercial school opened at Tokio, Japan, in 1885; and another at Kobe in April, 1903. Japan also has commercial schools graded A and B according to the difficulty of the curriculum. In 1904 there were 48 of these schools, at which children of an age of not less than ten years, provided that they have finished a four-years' course in the ordinary primary schools, are allowed to attend. In Germany there not only are commercial schools, such as have been mentioned, and *realgymnasien* in which modern subjects are emphasized but even commercial universities at Aix-la-Chapelle, Frankfort, Cologne and Leipzig. These universities have 2,841 students, of whom 1,015 are matriculated. In American colleges and universities in 1904 there were 1,537 regular students of commerce in all. Courses in commerce were attended by 6,835 men and 5,430 women.

The report of the Commissioner for Education in the United States in 1904, founded upon information received from 4,602 different institutions, shows that for the scholastic year 1903–04 there were enrolled 250,231 students in business or commercial studies. This was an increase of 6,710 over the preceding year. The regular business-schools had an enrollment of 138,363; the public high schools had 85,313 in business-studies; the private high schools and academies had 13,479; the normal schools 3,255; and the universities 9,821 students in commercial branches. These numbers may give an exaggerated impression of the efficiency of commercial education in the United States, for it is to be recollected that many of the students included may have studied one business or commercial subject only, and that as an extra. American private business and commercial schools were in the field early in the 19th century; they, however, are generally small and utilitarian in their aim. Public high schools endeavor to maintain broader educational aims; and are usually content to offer courses in bookkeeping, typewriting and stenography as electives. Separate high schools of commerce exist and are successful in New York City and Washington, D. C. Several high schools offer a commercial course which may extend over one, two, three or four years; for example, some of the high schools of Boston, Pittsburgh, Omaha and Philadelphia. Among the more important, endowed, secondary institutions which carry on commercial education should be mentioned Pratt Institute, Brooklyn, and Drexel Institute, Philadelphia. About one hundred normal schools invite commercial students. Colleges of commerce have been established in the universities of Pennsylvania, California, Chicago, Dartmouth, Illinois, Michigan, Wisconsin, Louisiana, Vermont, West Virginia, Nevada and Wyoming. See Dexter's *History of Education in the United States*, pp. 415–23.

Schoon'er. See SHIP.

Schopenhauer (*shō'pĕn-hou'ĕr*), **Arthur,** a German philosopher, was born at Dantzic, Prussia, Feb. 22, 1788. He studied at Göttingen, Berlin and Jena, hearing Fichte and Schleiermacher. From Weimar, where his mother resided, he went in 1814 to Dresden and from there to Italy, afterwards living at Berlin and Frankfort-on-the-Main. His chief book, *The World as Will and Idea*, gives a large part of his peculiar philosophy. *On the Will in Nature* and *Sight and Colors* are among his philosophical writings, which include many occasional papers and his prize-essay in the Norwegian Academy on *Freedom of the Will*, which brought him the first public praise. He died on Sept. 21, 1860. See *Lives* by Zimmerman and Wallace.

Schreiner (*shrī-nĕr*), **Olive,** whose pseudonym is Ralph Iron, was born about 1860 in Basutoland, South Africa, where her father, a German Lutheran clergyman, was a missionary in the service of the London Missionary Society. Her mother, however, was an English woman. In 1894 she married S. C. Cronwright. In 1883 she published *The Story of an African Farm*, a story of Afrikander life, replete with simple but forceful and fascinating pictures of South Africa and its peoples. *Dreams*, *An English South African's View of the Situation* (1899) and *Trooper Halket* are other publications of hers. Her husband and she also are joint-authors of *The Political Situation* (1895). Her judgments as to this and as to the Transvaal difficulties are those of one who, though half English, appreciates and sympathizes with the native Dutch of South Africa. Her home is at Hanover, Cape Colony.

Schubert (*shōō'bĕrt*), **Franz Peter,** a celebrated musical composer, was born at Vienna, Jan. 31, 1797. Before he was 11 years old he was singing in a church-choir, and was soon sent to the chorister's school of the court-chapel, where he became leader of the school-band. *The Erl King*, his immortal song, was composed when only 18, and the *Mass in F* while teaching in his father's school at Lichtenthal. In 1819 one of his songs, *The Shepherd's Lament*, was given at a concert at Vienna, and his comic operetta, *The Twins*, was produced at the theater there. As his songs became known, the enthusiasm with which they were received made publishers ready to accept his manuscripts, and as many as 20 songs were published in eight months. He made a tour with Vogl in 1825, delighting everyone with the performance of Schubert's seven songs from the *Lady of the Lake*, though the songs were afterward sold for only $100. He gave his first and only concert in Vienna in 1828, which was so successful as to put the needy composer, who had been selling some of his best songs at a penny, beyond want for a time. His musical productions are very numerous, as he wrote rapidly and steadily, sometimes composing six or seven songs in a morning. Everything he saw, heard or read suggested a subject; one of his piano-duets was inspired by the song which he heard sung by a Hungarian girl as he passed the kitchen door, and his *Hark! Hark! the Lark* flashed over him in a beer-garden. His songs are among his finest work, Beethoven, who saw them only on his death-bed, saying: "Surely Schubert has the divine fire." His compositions include more than 500 songs, ten symphonies, six masses, several operas, cantatas and a host of sonatas. He died on Nov. 19, 1828. See *Life* by Frost.

Schumann (*shōō'män*), **Robert,** a German musician, was born at Zwickau in Saxony, June 8, 1810. He began his musical studies in Leipsic, and in his haste, besides con-

stant practicing, tried some mechanical means for increasing the power of his hands, which resulted in a permanent injury to the right hand and compelled him to turn his attention to composition. For ten years he edited a musical journal, composing at the same time some of his best pianoforte works. Mendelssohn's coming to Leipsic in 1835 resulted in making it the musical center of Germany, and Schumann at once was one of his worshipers. His last years, in which he produced some of his best works, as the *Quintette* for pianoforte and strings, *Paradise and the Peri*, *Genoveva* etc., were clouded by brain-trouble, ending in insanity. The last two years of his life were spent in a private asylum near Bonn, where he died on July 29, 1856. His wife, a fine pianist, labored incessantly to have his works acknowledged, performing them in the chief cities of Europe with gratifying success. She lived to see him ranked among the great composers. See *Life* by Wasielewski.

Schumann-Heink, Ernestine (1861), a noted German contralto singer (family name Roessler), was born at Lieben, near Prague. A pupil of Marrietta Von Leclair, with whom she studied at Gratz, she afterwards made her début at Dresden in *Il Trovatore*, and appeared also at Hamburg and at Baireuth, where she sang in opera and especially distinguished herself in *Der Ring Des Nibelungen*. In 1883 she married Herr Heink, and ten years later she became the wife of Paul Schumann. In 1898 Mde. Schumann-Heink came to this country, where she became a favorite, alike of audiences and musical critics, for her singing both in opera and at concert.

Schur'man, Jacob Gould, American educator, president of Cornell University, was born at Freetown, Prince Edward Island, Canada, May 22, 1854, and was educated at Acadia College, Nova Scotia, graduated at London University, and pursued his studies at Paris and at Edinburgh, Scotland. He also took special courses at Heidelberg, Berlin and Göttengen, and on his return to Canada became professor of philosophy and English literature in two of the colleges of the Canadian maritime provinces. In 1886 he was appointed Sage professor of philosophy and dean of Sage School in connection with Cornell University. In 1892 he became president of Cornell, and at the same time edited *The Philosophical Review* and *The School Review*. In January, 1899, he was nominated by President McKinley as chairman of the Philippine commission, and given temporary leave of absence from Cornell. He is the author of *Kantian Ethics*, *Ethics of Evolution*, *The Ethical Import of Darwinism*, *Belief in God*, *Agnosticism and Religion*, *The Genesis of the Critical Philosophy*, *Philippine Affairs* and *Retrospect and Outlook*.

Schurz, Carl, was born in Liblar, Germany, near Cologne, March 2, 1829. His father was the schoolmaster of the village and was eager to give his boy as good an education as his frugal means would allow. He attended the gymnasium at Cologne, and, though compelled for financial reasons to leave before graduation, he succeeded in gaining entrance at the University of Bonn at 17. While at Bonn he came under the influence of Gottfried Kinkel, a professor of literature and rhetoric, who was earnestly devoted to the revolutionary movement of Europe. Under his influence he took part in the German revolutionary movement of 1848. When this collapsed, Kinkel was condemned to life-imprisonment at hard labor, and Schurz very narrowly escaped and concealed himself in Switzerland. Schurz could not rest until he had, by an almost unequalled feat of daring and skill, liberated his former instructor. He then fled to England where he remained for a short time, afterwards going to France. He kept in close touch with the revolutionary movement, and was a personal friend of Mazzini and Kossuth. In 1852 he came to America, and for fifty years played an important rôle in American political affairs. He was an officer in the Union army, and in recognition of his worth Lincoln made him ambassador to Spain. He soon resigned, however, to take a more active part in the war. He was promoted to major-general and took part in the battles of Second Bull Run, Chancellorsville, Gettysburg and Chattanooga. He entered journalism after the war and in this field won great distinction. Mr. Schurz was editor of *The New York Evening Post* and a contributor to *Harper's Weekly*. He was senator from Missouri (1869–1875) and secretary of the interior during Hayes' administration (1877-81), and always was an ardent supporter of the Republican party until it began to take up what seemed undemocratic principles. Mr. Schurz always was a strong supporter of Civil Reform, and was made president of the National Civil Service Reform League from 1892 to 1901. After the Spanish War he was one of the strongest opponents of the imperialist policy. As a political orator he exerted great influence. Most important among his publications are his *Life of Lincoln*, *Henry Clay* in the American Statesmen Series, *Eulogy on Charles Sumner* and his *Autobiography*. His death occurred on May 14, 1906.

Schuyler (*ski'ler*), **Philip John,** an American general, was born at Albany, N. Y., Nov. 22, 1733. He served in the French and Indian War, was a member of the colonial assembly from 1768 and of the continental congress of 1775, and one of the first four major-generals of the Revolutionary army. He was preparing to invade Canada as head of the northern department of New York, when his health obliged him to give up the command to General Montgomery, and in 1779 he resigned his office, though remaining

one of Washington's most trusted advisers. He made treaties with the Six Nations, and was state senator for 13 years, United States senator for two terms and surveyor-general of the state from 1782. He was one of the leaders of the Federal party in New York, and helped to prepare the state's code of laws. He died at Albany, Nov. 18, 1804. See *Life* by Lossing and *Philip Schuyler* by Schuyler.

Schuylkill (*skōl'kil*), a river of Pennsylvania, rising in the coal-region near Pottsville and flowing 130 miles southeast into the Delaware at Philadelphia, to which it furnishes its water-supply. Coal-barges ascend the river by the help of dams and locks.

Schwatka (*shwŏt'kă*), **Frederick,** an American arctic explorer, was born at Galena Ill., Sept. 29, 1849, and died at Portland, Oregon, Nov. 2, 1892. In 1871 he graduated from West Point, receiving a commission as lieutenant of cavalry in the United States army, which he resigned in 1884. Early in his career he became interested in arctic exploration and in the fate of Sir John Franklin. In 1878 he joined an expedition for King William's Land. This party returned two years after, having discovered and interred many of the skeletons of Franklin's crew and, in some degree, solved the mystery of that explorer's fate, bringing home interesting relics of Franklin's outfit. On this expedition the party made a sledge-journey of over 3,250 statute miles — the longest on record. Later Schwatka explored the course of the Yukon in Alaska, and in 1886 he commanded the New York *Times* Alaskan expedition and ascended Mt. St. Elias 7,200 feet. He sought also in northern Mexico for remains of Aztec civilization. He published *Along Alaska's Great River, A Nimrod of the North, Children of the Cold, The Franklin Search* etc. See Gilder's *Schwatka's Search.*

Sci'ence. To know a truth in its relation to other truths is to know it scientifically. For example, when one understands that the change of night and day depends upon the apparent daily motion of the sun, he has mastered a scientific truth which thinking-minds have known from time immemorial. By summing up every-day experiences like this man has been led to the belief that natural events follow each other in an orderly and connected way. To investigate this orderly connection is the aim of all science. The method in use is called the scientific method, and is that of observation and experiment. In this way great laws are deduced, or thought to be deduced, for history shows that the scientific beliefs of one age are time and again overthrown by the scientific discoveries of a later age. Great principles which lie at the foundation of all science have, however, been certainly determined, and especially have great advances in scientific knowledge been made in the last century. The different divisions of science have been grouped in different ways by Comte, Herbert Spencer and others. The most general division is into physical sciences, which have to do with matter and force; biological sciences, which consider the laws of life; and psychical sciences, which deal with the phenomena of the mind. Religion, agriculture, politics and art as truly are sciences as are geology and astronomy. But science is often used popularly to mean the physical sciences alone. See Jevons' *Principles of Science.*

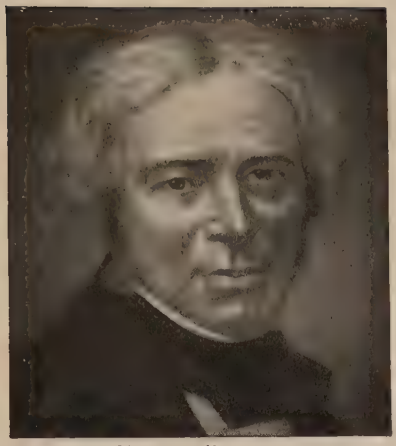
Scil'ly Islands, a group on the southwestern coast of England, 27 miles southwest of Land's End. There are six large and about 30 smaller islands, and many rocks and ledges. Tin is found in small quantities. Athelstan conquered the islands in 938, and put some monks on Tresco, where are still seen the ruins of their abbey. Queen Elizabeth leased the islands to Sir Francis Godolphin, in whose family they remained for 250 years. The star-castle on St. Mary's island was built by him, and the village of Dolphin on Tresco owes its name to the family. In 1834 they were leased to Augustus John Smith and in 1872 to his nephew. There are lighthouses on several of the islands, but wrecks were formerly common, one of the most noted being that of Sir Cloudesley Shovel's fleet in 1707, when 2,000 men were drowned. The principal industry is the cultivation of the narcissus and other lilies, 100 tons of flowers being shipped in a single spring. The mackerel-fishing in May and June is extensive, a daily steamer carrying away a cargo of 100,000 fish. See White's *Week in the Isles of Scilly.*

Sciop'ticon. See MAGIC-LANTERN.

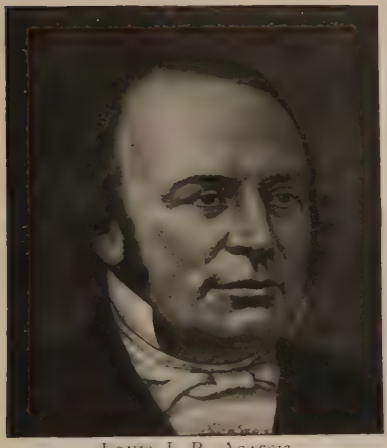
Scioto (*sī-ō'tō*), a river in southern Ohio. It rises in the northwest of the state, flowing east and south to the Ohio, which it enters at Portsmouth. It is 300 miles long, and is a feeder of the Ohio and Erie Canal.

Scipio (*sĭp'i-ō*), **Publius Cornelius,** called Africanus Major, a Roman soldier, was born in 237 B. C. He saved his father's life at the battle of Ticinus (218) and was also in service at Cannæ. He was so popular that he was elected to the Roman office of *ædile* before he was of legal age, and was chosen a "general extraordinary" for Spain by acclamation, a choice which his victories in that country, which gave the whole state to the Romans, proved wise. He succeeded in having the war carried into Africa, thus compelling Hannibal to leave Italy, and defeated him at Zama, Oct. 19, 202, thus ending the long struggle between Rome and Carthage. He was received in triumph at Rome, the title of Africanus given and the positions of consul and dictator for life offered, which he refused. With his brother he won the great victory of Magnesia over Antiochus, and when his brother was prosecuted for receiving bribes from Antiochus and condemned, he rescued him from prison.

Sir Humphrey Davy



Michael Faraday



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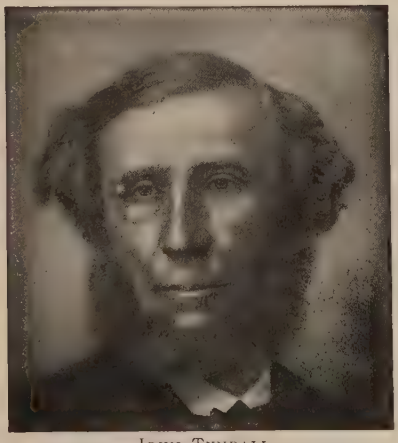

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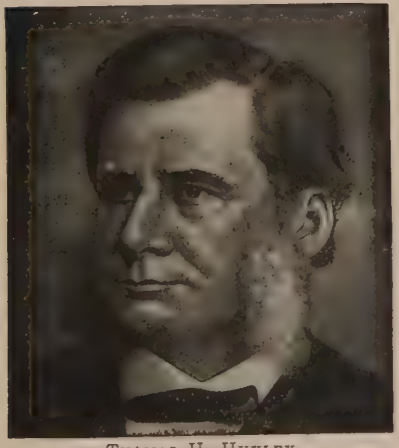

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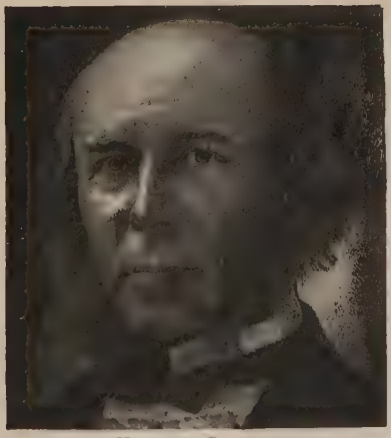

Herbert Spencer

GREAT SCIENTISTS

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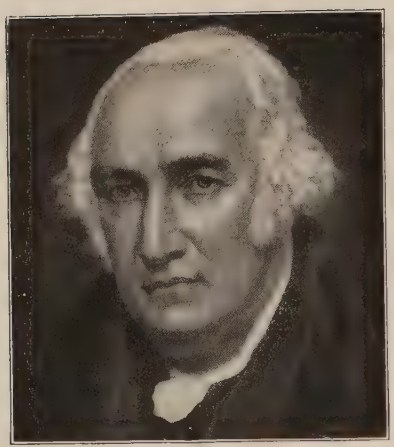
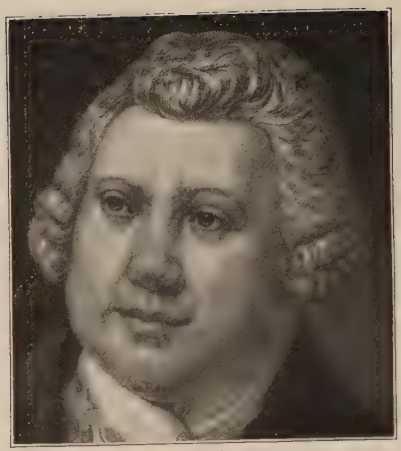
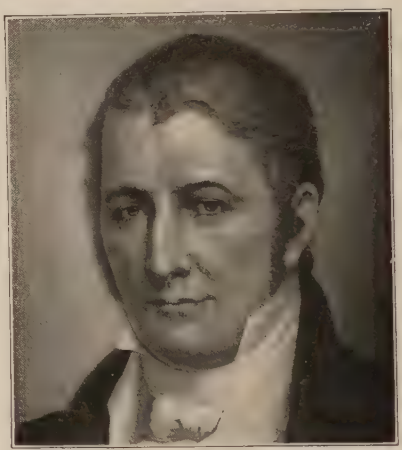


JAMES WATT

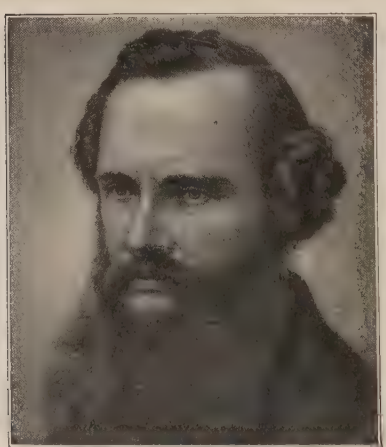


SIR RICHARD ARKWRIGHT

ROBERT FULTON



ELI WHITNEY



SIR WM. THOMPSON (LORD KELVIN)

SAMUEL F. B. MORSE

GREAT INVENTORS

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Later, charges were brought against Scipio himself, which he did not deign to notice, but on the first day of his trial told the story of his victories, and on the second day reminded the people that it was the anniversary of the battle of Zama and a time to give thanks to the immortal gods. In the popular excitement that followed the prosecution was ended. His daughter was Cornelia, the mother of the Gracchi. He died at his country seat in Campania about 183 B. C.

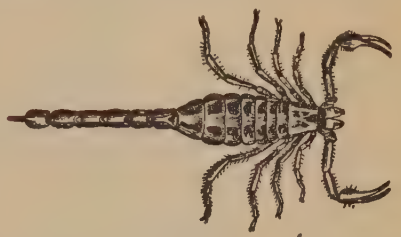
Scipio, Publius Cornelius, called Africanus Minor, was born 185 B. C. He was the son of Lucius Æmilius Paulus, the conqueror of Macedon, but was adopted by Publius Scipio, a son of the great Scipio. He fought with his father at Macedon, went to Spain as military tribune, and in 149 B. C. laid siege to Carthage. He was elected consul in 147. In 146 he took Carthage by storm, and obeyed with sorrow the harsh order of the senate to raze it to the ground and plow its site. As he gazed on the ruin, the thought of the possible destruction of Rome flashing over him, he quoted the words of the *Iliad:* "The day shall come when sacred Troy shall perish, and Priam and his people shall be slain." In 142 he was censor, in 139 an ambassador to Egypt and Asia, and in 134 he was re-elected consul. The contests in Spain tried the best skill of the Roman generals, until in 134 Scipio was sent to Spain, and, after an eight months' siege of Numantia, destroyed the city. In the political troubles at Rome Scipio angered the reform party by interfering for the Latins whose lands were being seized in the haste to carry out a new measure, and he was found dead in bed in 129 B. C., doubtless murdered by some member of the party.

Sclerenchyma (*sklĕ-rĕn'kĭ-mȧ*) (in plants), a tissue whose cells have walls uniformly thickened. These cells usually are more or less elongated, and a common form is fibrous. Sclerenchyma is a mechanical supporting tissue and is generally developed wherever strength is needed. It is very commonly associated with the vessels, forming the so-called fibers of the fibrovascular bundles. It is also frequently developed in the cortex, either in strands or in bands.

Scol'lard, Rt. Rev. D. J., Bishop of Sault Ste. Marie, was born in Ennismore, Ontario, Nov. 4th, 1862. He entered St. Michael's College, Toronto, in November of 1882; was class-leader during his whole classical course, taking Elmsley Scholarship in 1885 and Campbell Classical Medal in 1886; and graduated with honors in 1887. He entered Sulpician Grand Seminary at Montreal in September, 1887, became bachelor of divinity in 1889 and obtained the degree of licentiate in sacred theology in 1890, and graduated in December, 1890. He was ordained on December 21st, 1890, appointed assistant-priest at St. Peter's Cathedral, Peterboro, Ontario, in 1891, and made bishop's secretary and chancellor of the diocese of Peterboro in April, 1893. He was appointed pastor of St. Mary's Church, North Bay, Feb. 16th, 1896, and was in charge of this parish until appointment as bishop of the new diocese of Sault Ste. Marie on Sept. 21st, 1904. He was consecrated bishop on Feb. 24th, 1905.

Scone (*skōōn*), a town in Scotland, two miles north of Perth, on Tay River, celebrated as the place where the Scottish kings were crowned from 1153 to 1458. The Stone of Destiny, on which the kings were seated, was carried off in 1296 by Edward I. See Urquhart's *History of Scone.*

Scor'pion, the common name for any member of the natural order of jointed



SCORPION

animals called *Scorpionida.* These animals are united into a class with the spiders. They have long, slender bodies and resemble in a general way the small lobster. The head and thorax are joined into a single division, but the long abdomen is plainly jointed. It is divided into two portions: a broad part of seven joints and a more slender, tail-like part with five joints. The latter is terminated by a sting, and is carried arched over the back of the animal. The thorax bears four pairs of walking-legs. The most prominent appendages are the pedipalps, which extend forward and end in broad claws. Scorpions are restricted to warm countries. They range in length from two to eight inches. Small kinds are common in the southern portion of the United States. During the day they lie concealed under stones and in holes, but they are active at night. Their food is insects, spiders and other small animals. They are able to inflict a severe wound with their sting, but it is rarely if ever fatal.

Scot'land is one of the political divisions forming the British Empire, and is the northern part of Great Britain, surrounded by the ocean on all sides except the south, where it touches England. It is 274 miles long and from 24 to 146 miles wide, including 29,796 square miles, which makes it about as large as Indiana. The coast of 3,000 miles is deeply indented, so that very few places are more than 40 miles from the sea, and there are 186 islands, mostly in the

Hebrides, Orkney and Shetland groups. Solway Firth, Liddel and Tweed Rivers and Cheviot Hills separate Scotland from England. The rivers, flowing mostly to the sea, are not large, the Clyde of 106 miles being the longest. The Tweed, Forth, Tay and Dee are well-known, as are also the beautiful fresh-water lakes of Loch Lomond, Loch Katrine, Loch Leven etc. The division of the country into Highlands and Lowlands is rather a division of race than of country, for, though the Highlands include the more mountainous parts of the country, they have rich, level tracts, while there is hardly any part of the Lowlands without mountains. The Highlands are that part of the north and northwest of Scotland where the Celtic language and customs still linger, and include the Hebrides, but not the Orkneys and Shetlands, where the people are of Norwegian origin. There are nearly 200 mountain-peaks in Scotland over 3,000 feet in height, the highest being Ben Nevis, 4,406 feet. The northern Highlands, the Grampians and the Cheviot Hills, with their beautiful glens and mountain lakes make the famous scenery of Scotland. The nearness of the ocean tempers the climate, so that the thermometer rarely falls to zero in winter or rises above 80° in summer. The animals and plants resemble those of England. About half of the birds are waterbirds, and fish, especially shellfish, abound. The country is not well-adapted to agriculture, because of its cool summers, late springs and heavy rains, but it is carried on with great care and the use of the most improved methods; and in the wildest mountain-regions sheep graze. The fisheries form an important industry, especially the salmon, herring, cod and ling. The salmon is so abundant that before it was sent to England in large quantities, servants used to make a condition that they should not be fed upon it more than three times a week. The principal minerals are coal, iron known in the United States as Scotch pig, lead, granite, sandstone and other fine building-stones. The linen, cotton and wool manufactures are large, and there are silk, hemp, hosiery, hats, leather and soap factories and large breweries and shipyards.

Scotland, since its union with England, sends 16 peers to the house of lords and elects 72 members to the house of commons. It has its own courts and its state religion, which is Presbyterian. Its common-school system, going back to 1695, made the Scottish people of the 18th century the best educated in Europe. There are four universities, Glasgow, Aberdeen, Edinburgh and St. Andrews.

The early inhabitants were the Picts, a collection of Celtic tribes, and by the Romans the country was called Caledonia. The Scots were a tribe from Ireland, then called Scotia, who settled on the western coast of Caledonia, and the kingdom of the Picts and Scots seems to have been first called Scotland in the 10th century. There are 38 Pictish kings mentioned in early Scotch history. The Saxons settled in the lowlands in 449, and one of their leaders, Edwin, founded Edinburgh (Edwin's burgh). The introduction of Christianity into Scotland by Irish missionaries dates back to the 6th century. In the 9th century the Scots became the leading power in the country, and the government was in the hands of Prince Kenneth Macalpin. The first great battle of Scottish princes on English soil was fought in 937 between Constantine their king, aided by the Danes, and Saxon King Athelstan. During the reign of Malcolm, the son of Constantine, Edmund, king of England, restored to that prince a part of the Cambrian kingdom, which Edmund had wrested from the Britons, and this grant was the pretext for the claim of homage from the Scottish rulers, made by the English kings for so many years. Malcolm II, Duncan and Macbeth, a usurper, the next three kings of Scotland, are well-known through Shakespeare's tragedy. Malcolm III defeated Macbeth in 1057. His wife was Margaret, the sister of Edgar, the Atheling of England, and her influence and that of his own life in England led to the introduction of English customs; while the tyranny of William the Conqueror drove large numbers of the Saxons into Scotland. The three sons of Malcolm who succeeded him, Edgar, Alexander and David, continued their father's policy; David was to Scotland what Arthur was to Britain. He established Norman, English and French colonies, introduced a system of written law, and placed the religion of the country on a new basis, providing for the support of the clergy and the building of churches. His grandsons, Malcolm IV and William the Lion, and Alexander II, the son of William, bring the list of Scottish kings to Alexander III, one of the ablest and best of their rulers. His sudden death in 1286 ended the period of Scotland's prosperity that had lasted for 400 years. The struggle for the succession between Balliol and Bruce and the ambition of Edward I of England, who had conquered Wales, to add Scotland to his kingdom, brought in the series of conflicts under Wallace and Bruce, ending in the battle of Bannockburn.

Robert I (Robert Bruce) was succeeded by David, his infant son, and his grandson Robert, who, as Robert II, heads the list of the Stuart sovereigns of Scotland, which numbers fourteen; an unfortunate race, including Robert II; Robert III, who died of grief, with his older son murdered and his younger son an English captive; James I, for eighteen years a prisoner in England and finally murdered; James II, killed in battle; James III, murdered with his son in rebellion against him; James IV, killed at Flodden; James V, who died broken-hearted at the

rout of Solway Moss; Mary, twice a widow and twenty years a captive, beheaded at Fotheringay Castle; and James VI of Scotland and I of England. The feuds of the powerful nobles of Scotland and the struggles with England kept the country in a state of turmoil. In 1503 James IV married Margaret of England which finally resulted in the Union of the two kingdoms. Under James V reli ious struggles added to the troubles of the country, and James VI became king of England on the death of Elizabeth in 1603.

The Scotch parliament met for the last time in 1706. The leading statesmen of both Scotland and England felt that nothing but a complete union of the two countries would bring about permanent peace, and, though opposed by a majority of the people, the Scottish parliament passed the Act of Union on Jan. 16, 1707. The union was unpopular in Scotland for many years, but with the evident prosperity of the country under the new arrangement discontent gradually disappeared; though Scotland and England are still two countries, and a Scot abroad, if asked if he is an Englishman, will seldom answer "yes." The Gaelic language used in the west and north of Scotland is a Celtic dialect, while the Lowland Scotch is a form of the Saxon, being the same as the northern English of Northumbria. The dialects are many, classed as Border Scotch, Central Scotch and Northeastern Scotch. The chief cities of Scotland are Edinburgh the capital (population 355,366), Glasgow (872,021), Dundee, Aberdeen, Leith, Paisley and Greenock. Population 4,759,445. See BRUCE, ENGLAND, GREAT BRITAIN and MARY STUART. See *Scotland under Early Kings*, by Robertson; *Scotland as It Was and as It Is*, by Argyll; *Scotland from the Earliest Century to the Present Time*, by Mackintosh.

Scot'tish Literature. See LITERATURE, ENGLISH.

Scott, Captain Robert F., of the British navy, commanded two expeditions to the South Pole. He successfully reached the Pole with four companions January 18, 1912, and there found Amundsen's tent and records (See POLAR EXPLORATION). On the return journey with his three surviving companions, he perished in a blizzard. With his body was found his diary in which he recorded their misfortunes, and asked his countrymen to provide for their dependents. All were pensioned by parliament, and Captain Scott's wife given the title of "Lady Scott."

Scott, Duncan Campbell, was born in 1862, educated at Stanstead College (Quebec), and joined the Canadian Civil Service at Ottawa in 1879 and quickly received promotion. His short stories and poems have appeared in the best magazines. He is an editor of historical biographies now being published.

Scott, Sir Walter, the Scottish novelist, was born at Edinburgh, Aug. 15, 1771. He became lame as the result of a fever when an infant. At Edinburgh University, where he studied, he declined to learn Greek, which he regretted in his later years. He studied law, and as a lawyer's clerk superintending the removal of a family who had not paid their rent he first entered the Highlands. His first publication was rhymed versions of ballads by Bürger (1796). The first two volumes of *The Border Minstrelsy*, for which he had been preparing himself by gathering legends and hunting up old ballads for nearly ten years, appeared in 1802. *The Lay of the Last Minstrel*, begun as a ballad, published in 1805, made him very popular; *Marmion* followed in 1808; and in 1810 came *The Lady of the Lake*. He was now offered the place of poet-laureate, but declined in favor of Southey. His first novel, *Waverley*, was begun in 1805, but laid aside until 1814, when he wrote the last two volumes in three weeks. *Guy Mannering*, "the work of six weeks," and *The Antiquary* followed, all "by the Author of *Waverley*," as Scott's authorship was not known. They were very popular, and in wonderfully quick succession followed *Rob Roy*, *Old Mortality*, *The Heart of Midlothian*, *Ivanhoe* and the rest of the world-famous stories. His purchase of Abbotsford, the sums spent on its improvement and his generous hospitality and liberality, especially to poor writers, had used up his large receipts from his writings. The failure of both the firms that published his works, in one of which he had been a secret partner, placed Scott heavily in debt. His friends offered help and his creditors a compromise, but he declined both, and at 55 bravely undertook to pay off a debt of $700,000 by his pen. He wrote 14 hours a day, producing his *Life of Bonaparte*, several series of *Tales of a Grandfather* from Scottish history and *Woodstock*. At a public dinner in Edinburgh in 1826 he made himself known as the author of the *Waverley Novels;* which the public had already discovered, and he afterwards furnished notes and prefaces for a new edition. But his excessive labors brought on symptoms of paralysis, and he sailed to Italy for rest, everywhere receiving the honors due to his literary fame. His failing strength warned him of the end,

SIR WALTER SCOTT

and he begged to be taken back to his beloved Tweed. He reached Abbotsford, where he died on Sept. 21, 1832. In the last moments of consciousness he turned to the window for a last look at the Tweed, and then said: "To-night I shall know all." At his death over $500,000 of his debts had been paid, and, soon after, the copyrights of his novels brought in sufficient to pay the last dollar. His novels have been translated into almost every civilized language. He was buried at Dryburgh Abbey, and a Gothic temple was built to his memory at Edinburgh. See *Life* by Lockhart; *Journal* by himself; and *Scott*, in the English Men of Letters Series, by R. H. Hutton.

Scott, Winfield, an American general, was born at Petersburg, Va., June 13, 1786. He studied at William and Mary College,

WINFIELD SCOTT

and first became a lawyer, but in 1808 entered the army as captain. In the War of 1812 he was sent to the Canadian border, where he fought at Queenston and at Lundy's Lane, being taken prisoner at Queenston, but was soon exchanged and was wounded in both the battles, having two horses shot under him at Lundy's Lane. He was made a major-general for his services, receiving also the thanks of Congress. His services were helpful in preserving peace during the nullification troubles in South Carolina, where he commanded the Federal forces at Charleston Harbor, and also in the disputes about the border of Maine in 1839. As commander-in-chief of the United States army, which office he held from 1841, he took command of the invasion of Mexico in 1847. He captured Vera Cruz, and defeated Santa Anna at Cerro Gordo, taking Jalapa and Puebla. The battles of Contreras and Churubusco might have been followed by the taking of the capital, but an effort was made to negotiate a treaty. The castle of Chapultepec was taken by storm, and on Sept. 14, 1847, Scott's army marched into the City of Mexico, where he commanded until the treaty of peace was signed in February, 1848. He was a candidate for the presidency in 1852, but failed of election. At the beginning of the Civil War he was in charge of the army, but soon yielded his position to younger and stronger men. He died at West Point, May 29, 1866. Exceptionally competent military men rank him highly as a general. See *Life* by Mansfield and *Memoirs* by himself.

Scran'ton, Pa., a city on Lackawanna River, is 144 miles northwest of New York. It is a substantially built city and the third in size in the state. Its prosperity is largely due to its situation in the anthracite region, which gives it an immense coal-trade and a large business in mining-supplies. It has many and various industries which furnish employment for 30,000 people. There are great iron and steel factories, which produce locomotives, boilers, machinery and tools, besides many silk-mills, which give Scranton second place in the United States in this line. The large foreign population is principally engaged in mining. Much attention is given to school-work, and for this purpose there is an annual expenditure of half a million dollars. There are more than 40 public-school buildings, two high schools and one manual-training school. Scranton has ten colleges and academies, five public libraries and many beautiful churches. It has three electric lines and excellent railroad facilities, having the services of five railroads. Population 129 867.

Scream'er, a class of South American birds most nearly resembling ducks and geese. The horned screamer, found in Brazil and Guiana, is about as large as a turkey and blackish brown in color, with a long, slender horn on the head. It lives in swamps, eating the leaves and seeds of water-plants. The crested screamer has no horn, but, instead, a bunch of tall feathers. The name is given beause of its loud, harsh cry.

Screw, a simple mechanical device for transforming a motion of rotation into one of translation. An external or ordinary screw is made by cutting a spiral groove on the surface of a cylinder; an internal screw, generally called a nut, is made by cutting a similar groove on the inside surface of a cylinder. The elevation of metal adjoining this groove is called the thread of the screw. When the nut is slipped over the screw and held so that it cannot rotate, and the screw is placed in bearings so that it cannot be translated, it is evident that for every turn of the screw the nut must advance along the axis of the screw by a definite amount. The amount of this advance is called the pitch of the screw. The arrangement just mentioned forms the most accurate mechan-

Poems in Stone

The Works of Modern Masters

ON this page we pass to modern sculpture.

What an inspiring note we have in this beautiful "Laughing Boy" by Donatello—a perfect type of the happy childhood at which modern education, among other things, aims. The original is in Florence.

The Lorenzo de Medici is also called "The Thinker." Compare this cultivated, aristocratic nobleman with Rodin's "The Thinker"—primitive man gazing at his descendants in Dante's "Inferno." How far man has progressed *materially* since his time; how slow man's progress in *moral* civilization!

Thistle Print, Detroit Publishing Co.

Lorenzo de Medici, by Michelangelo
(Italian b. 1475)

Pantheon, Paris

The Thinker, by Auguste Rodin
(French b. 1840)

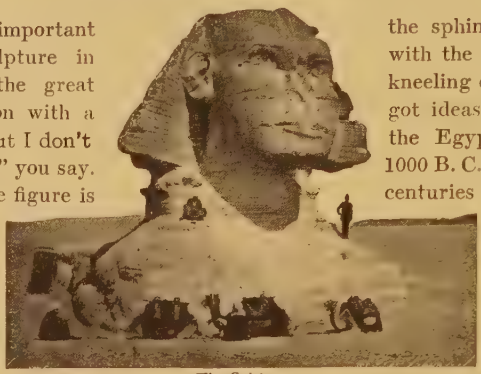
The Lion of Belfort, Belfort, France, by F. A. Bartholdi (French b. 1834)

Commemorates gallant and successful defense of the town in Franco-German War.

Poems in Stone

Great Works of the Ancients

THE oldest important piece of sculpture in existence is the great Sphinx, a huge lion with a human head. "But I don't see any lion's body," you say. That is because the figure is half-buried in the desert sand. Compare the height of the man standing under the chin, with the face of the sphinx, and its breadth with the length of the three kneeling camels. The Greeks got ideas of sculpture from the Egyptians as early as 1000 B. C. It took them many centuries to bring sculpture to the perfection of the Venus, the Winged Victory and the noble figures of the Parthenon.



The Sphinx

Original in the Louvre, Paris
Venus de Milo

Louvre
The Winged Victory

From the Frieze of the Parthenon
The Panathenaic Procession

ical method for measuring small distances and for producing small displacements.

Ordinary screws are generally made by forcing a steel nut, called a die, over a cylinder of metal. In like manner, nuts are made by forcing a conical screw, provided with sharp cutting-edges, through a hollow cylinder of metal. This conical screw is called a tap. Higher grades of screws are made by placing a cylinder between the centers of a lathe and then moving the cutting tool along the lathe-bed on a carriage which is itself operated by another screw.

With elaborate precautions, Professor Rowland (*q. v.*) succeeded in this way in making a more perfect screw than had ever been made before, on which, when finally corrected, moved the ruling-point of a dividing-engine with such accuracy that no single ruling was in error by as much as 1-100,000 of an inch. Woodscrews, so-called, are metal cones, upon which a thread has been cut and a slotted head made. They have pointed ends for starting into wood, where they cut their own nuts and act rather as *clamps* than *screws*. Consult SCREW, in *Encyclopædia Britannica*, by Rowland and Rankine's *Machinery and Millwork*.

Screw-Propel'ler, a wheel with two or more radial blades in the form of a helix or spiral, used to propel a vessel. In modern ocean-steamers, there generally are two propellers, one on each side of the keel. The action of the propeller is similar to that of a screw revolving in a fixed nut, the water being more or less fixed as regards the revolving propeller. The screw-propeller was suggested by Bernouille of France in 1752, and in 1801 John Stevens of Hoboken, N. J., made a successful experimental boat with a screw-propeller. But it was not until between 1835 and 1840 that it began to come into general use. Its practical use was then demonstrated by F. P. Smith in England and by Capt. John Ericsson, first in England and later in the United States. Ericsson is generally given the credit of having made the first successful application of the screw-propeller to steam-navigation. At present it is the only method of propulsion used on large steam-vessels. The design of the shape and size of the propeller depends on conditions more or less peculiar to each vessel, and requires not only calculations but often experiments before the best shape is found for a given boat. Propellers are generally made of gun-metal. The dimensions of the propellers and shafts on the transatlantic steamers are very large. For the *Celtic*, a White Star steamer of 14,259 tons displacement, the two propellers each have a diameter of 20 feet and are carried on steel shafts of 19½ inches diameter. Consult the U. S. Navy Dept.'s professional papers.

Scribe, a name used among the Jews originally to indicate a military officer, whose business was recruiting soldiers and levying taxes. Later the name was given to those who copied the books of the law, and, as those who copied the law became its best expounders, the word had in the time of Christ come to mean an expounder of the law or a learned man. Scribes were found all over Palestine, and were reverenced by the people as public teachers and lawyers. Some were members of the Sanhedrin or court, and some had public class-rooms, where their disciples sat at their feet. Those who did not fill these higher places were engaged in copying the books of the law and of the prophets and in writing contracts, letters of divorce etc. See Schürer's *History of the Jewish People in the Time of Christ*.

Scud'der, Horace Elisha, American man-of-letters, was born at Boston, Mass., Oct. 16, 1838, and graduated at Williams College. After teaching for three years in New York City, he took to writing stories for youth and edited a magazine in their interest. From 1890 to 1898 he edited *The Atlantic Monthly*, and became a resident of Cambridge, Mass. Here he assiduously pursued a literary life, writing, besides his successful series of *The Bodley Books* and a brief *History of the United States*, a monograph on *Noah Webster*, an historical biography of *Washington* and a collection of essays and criticisms entitled *Men and Letters*. He was the editor, also, of the series of volumes of the *American Commonwealths* and author, jointly with Mrs. Taylor, of the *Life of Bayard Taylor*. He was one of the writers, moreover, of Bryant and Gay's *History of the United States* and of Justin Winsor's *Memorial History of Boston*. Above all, he wrote the classic biography of James Russell Lowell. He died on Jan. 11, 1902.

Sculpture (*skŭlp'tûr*), from a Latin word meaning to cut out or carve, is the art of representing the form of an object in a solid substance. When a figure is only partly raised from a background, it is called relief and has different names according to the degree in which it is raised, as bas-relief, meaning low relief. Wood, marble, granite, bronze, gold and ivory are some of the materials used in sculpture, anything that can be cut or molded into shape being used. The Greeks and Romans worked largely in marble, especially the pure, white marble brought from Paros (*q. v.*) called Parian marble. The art is an ancient one, beginning with the use of memorial stones and the making of images of the gods. The Egyptians are among the earliest nations to use sculpture in their religion, their temples being covered with reliefs, while innumerable statues of gods stood upon their plains. The Sphinx was probably sculptured about 4,000 B. C. The specimens of Assyrian sculpture found

belong to the 9th and 8th centuries B. C. and are largely bas-reliefs, made on a large scale and of curious forms, as the colossal winged bulls, with human heads, that guarded their palaces. The first monument of classic Greek art which has come down to the present time is the marble statues on the temple of Athena at Ægina, by an unknown author. They now are at Munich. Pheidias, the greatest of Greek sculptors and of the world, known by his great work, the Parthenon was followed by Praxiteles, Scopas and Lysippus, with such works as the *Venus of Milo*, *Apollo Belvedere* and *Laocoön*. The best artists of Rome were Greeks, and her treasures of art were largely brought from the plundered cities of Greece. For centuries the art of sculpture was almost lost until the 14th and 15th centuries, when Ghiberti made his wonderful gates at Florence and Donatello his statues of St. Mark and St. George, and Michael Angelo towered above all others. The 17th century witnessed only a falling back in the art of sculpture, with no immortal names among the artists; but the names of Houdon, Canova, Chantrey, Gibson, Thorwaldsen and Rude, among others, adorn the 18th century. The art had many followers in the 19th century, as Alfred Stevens of England, with his magnificent monument to the Duke of Wellington, and Barye, Rodin and many others in France, and Powers, Crawford, Greenough, Rogers, MacMonnies and St. Gaudens in the United States. See *History of Sculpture* by Lübke and *History of Greek Sculpture* by Murray.

Scutari (*skōō'tä-rē*), a town in Turkey, on the eastern shore of the Bosporus, opposite Constantinople, of which it is a suburb. It is built on the slopes of a hill, and has handsome mosques, bazars, a *dervish* college and factories of cotton, silk and leather goods. It is famed for its large cemeteries adorned with great cypress-trees, where many of the Turks from the city are buried, because it is the sacred soil of Asia. During the Crimean War the barracks and hospital of the English troops were at Scutari, and formed the scene of Florence Nightingale's labors. A marble obelisk marks the site of the English burial place. Population from 30,000 to 40,000. Scutari also is a government in Albania; area 4,170 square miles; population 294,100.

Scylla and Charybdis (*sĭl'lä and kä-rĭb' dĭs*), in Greek legend, were two sea-monsters who dwelt on opposite sides of a narrow strait. Scylla had 12 feet, six necks and six mouths, with three rows of teeth in each, and barked like a dog. Charybdis lived on a cliff under a large fig-tree and three times a day she sucked up the waters of the sea, and three times threw them back. Ulysses passed safely between the monsters, but Scylla snatched away six of his sailors. The names are now applied to a whirlpool in the Straits of Messina near Italy. From the difficulty of passing between them without falling into one or the other rises the proverb: To shun Charybdis and fall into Scylla.

Scythians (*sĭth'ĭ-ans*), an ancient race of Asia. The name is given either to the Scythians proper, the Scolots, or to all the wandering tribes who lived on the steppes from Hungary to Turkestan. The Scythians proper were a wandering people, living in the treeless plains between the Danube and the Volga. They lived in tent-covered wagons, kept herds of horses, cattle and sheep, fought with bows and arrows on horseback, made drinking-cups of the skulls of their enemies, and worshiped (without images) gods like those of the Aryan Greeks. They seem to have learned some of the arts of civilized life from the Greek colonies, and a Scythian king went to Athens to study under Solon. In the 7th century they invaded Media occupying it ten years, until Cyaxares made all their chiefs drunk at a banquet and slew them. The Scythians of Europe were nearly exterminated by the Sarmatians (*q.v.*) in the 4th century. The Scythians of Asia overran Parthia (northeastern Persia) about 128 B. C., and founded a kingdom in the eastern part of the empire, so that that part of Asia was called Indo-Scythia. In the century before and the century after Christ they invaded northern India, where they held possession for four or five centuries. Consult Mahaffy's *The Greek World under Roman Sway*.

Sea. The waters of the sea cover about 143,259,300 square miles or about five sevenths of the earth's surface. The ocean-basins are filled with sea-water to within about 2,250 feet of the general level of the continents, the average depth of the water in these basins being 12,480 feet. Were the solid crust of the earth to be reduced to a level, the surface of the earth would then be covered by a universal ocean with a depth of about two miles. The greatest depth recorded is 4,655 fathoms in the North Pacific, east of Japan. The bulk of water in the whole ocean is stated to be 323,800,000 cubic miles. The temperature of the surface waters varies from 28° F. in the polar regions to 85° or 86° F. in equatorial regions. The bottom waters vary from 32.7° F. to 36.8° F. At a depth of a little over half a mile the water of the tropics generally has a temperature below 40° F. The circulation of oceanic waters is kept up by the action of the prevailing winds on the surface layers. In the southern hemisphere the warm water of the tropics is driven to the south along the eastern coasts of South America, Africa and Australia, till, between 50° and 55° latitude, it sinks on being cooled, and spreads slowly over the ocean floor to the

north and south. A similar circulation takes place in the north; the cold water which occupies the deeper parts of the Arctic basin is largely made up of the dense Gulf-Stream water which sinks to the bottom on being cooled in the Norwegian sea. The water evaporated from the sea is borne to the land, and condensed on the mountain slopes. Over 6,500 cubic miles of this water are yearly sent back to the sea by rivers, carrying with it salts and earthy matters; in this way the ocean has in all probability become salt in the course of ages. The saltest waters are found where evaporation is the greatest, for example in the Red Sea, the Mediterranean and the trade-wind regions of the ocean-basins. Owing to the constant circulation in the ocean, oxygen and other gases of the air are carried down to the greatest depths; thus animals and plants may flourish throughout the whole extent of the ocean. Water is but slightly compressible, and almost any substance which will fall to the bottom of a tumbler of water will in time fall to the bottom of the ocean. Still, the pressure amounts to four or five tons per square inch; hence in an ocean with a depth of five miles, were the action of gravity suddenly to stop, the ocean-waters would rise 500 feet above their present level by expansion.

Pure sea-water is a light shade of blue; but it sometimes is a shade of green or brown, owing to foreign matter or plants and animals floating in it. Some form of life is scattered throughout the whole ocean. A trawl at a depth of over two miles brought up 200 specimens of living animals; a trawl in about three miles' depth yielded 50 specimens; and fishes and animals have been found at over four miles' depth. The term *benthos* is now used for all animals and plants which live attached to, or creep over the bottom of the ocean, *plankton* being the term for all plants and animals which live in and are carried along by the currents of the ocean. Life is most abundant in the surface waters down to about 100 fathoms, is less abundant in the intermediate regions, and becomes more plentiful within a few hundred fathoms of the bottom. The shells and skeletons of animals and fishes fall to the bottom after death and make a large part of the sea-deposits in many regions, especially in the deeper parts of the ocean. Besides these pelagic deposits, there are others, mainly made up of the débris from the solid land of the globe, laid down in greater or lesser nearness to the shores of continents and islands, which are called terriginous.

Sea-Anem'one. A kind of polyp which does not secrete a coral-stock. They resemble flowers in shape and coloration, and are among the most interesting organisms to be met with on the sea-beach. They prove a great attraction in aquaria. Their essential structure is that of a fleshy cylinder attached by its base to a rock and presenting at its free extremity the mouth surrounded by a fringe of tentacles, sometimes as many as 200, by which the little animal seizes its food,—small crustaceæ and mollusks. They are practically stationary, but can move very slowly over the surface to which they attach themselves. They grow to three inches in diameter. They multiply by budding and by eggs. They are very long-lived. One taken by Sir John Dalyell in 1828 lived until 1887. They are used as food in Italy, Greece, Provence and various other coasts.

SEA-ANEMONE

Sea-Cu'cumber is a name applied colloquially to the holothurian, which is a soft and worm-like sea-polyp. All these species have a very simple bodily structure, with great power of reproducing parts that are injured or lost. They possess sensitive tentacles at the mouth. The large sea-cucumbers or sea-slugs, known as *beche-de-mer* or *trepang*, are highly prized by the Chinese for food. *Trepang* properly is the dried body of this sea-cucumber. It is gelatinous, and used in soup. Sea-cucumbers are most numerous in the warmer reigons of the Pacific.

Sea-Hare. A small mollusk, slug-like in appearance, deriving its popular name from the prominent character of its front pair of tentacles, which somewhat resemble the ears of a hare. They are widely distributed and generally inhabit muddy or sandy tracts. They feed on sea-weeds and small crustaceans. Sea-hares were notorious among the ancients for their supposed venomous properties, and were used as ingredients of poisonous potions. A chief proof of the magic-practice of Apuleius was the fact that he obtained sea-hares from fishermen. They are harmless, but some species exude an acrid liquid irritating to the human skin. They also emit a rich, purple fluid which, like the ink of the cuttlefishes, has the property of diffusing itself quickly throughout the surrounding water.

Sea-Lion. See SEAL.

Sea-Ur'chin, a very common sea-animal grouped with the *Echinoderms*. The common sea-urchin has a globular shell or *test* composed of carbonate of lime, and made of

six-sided plates nicely fitted together. The shell is covered with spines, which vary in length and size according to the variety of the animal. Five rows of the plates composing the shell are perforated by openings for the tube-feet, and five rows are without such openings. The animals move mainly by tube-feet, but the spines also are movable and aid in locomotion. The mouth, with a complicated masticating apparatus, is on the under side. They feed on seaweeds and organic matter found in the mud. Some forms are flattened and called sand-cakes. For illustration see ECHINODERMATA. See, also, SAND-DOLLAR.

Seal, a carnivorous animal fitted for a life in the water. The animal famous for

FUR-SEAL

yielding the valuable fur, called seal-skin, is not a true seal, but a kind of sea-lion with ears and more flexible limbs. The true seals have no external ears and their hind limbs are closely united together, being useless on land but very effective in water. The hind limbs of the sea-lions are separated, and are used by the animal when on land. All kinds of seals come on the land or on ice in great numbers during the breeding-season. The true seals vary from four to eight feet in length. Their fur is stiff, and they lack the woolly under fur of the fur-seals. They occur on both sides of the Atlantic. The common harbor-seal is found on British coasts and on those

GREENLAND SEAL

of Europe and North America. It is four or five feet long, usually yellowish gray, with darker spots. The Greenland seals are larger; they congregate on shore in immense numbers for breeding. All true seals are awkward on land, and move by means of the muscles of the trunk, assisted a little by the fore limbs. The hind limbs are entirely passive. A large number (390,-174 in 1892) are killed annually for their hides and oil. Seals feed mainly on fish, but also eat crustaceá and mollusks. The harbor-seals are sometimes destructive to salmon. The eared-seals, sea-lions, or sea-bears vary greatly in size. The larger ones reach a length of about ten feet. Their hind limbs are flexible and they make considerable journeys inland, but return to the water for food. To this group belong the fur-seals of the northern Pacific. They are of moderate size, a full-grown male being about six feet and a female about four feet in length. These animals breed on the Pribilov, Commander and Robben Islands of the North Pacific and of Bering Sea. Since 1835 they have in a measure been protected by law. The males three years old — at which age their fur is finest — are taken for their skins, with unusually large ones two years old and small ones four years old. From 1871 to 1889, inclusive, about 100,000 animals were taken annually, but they began to show a decline in 1885, and in 1890 only 21,000 skins were secured. In 1895 and 1896 the number was reduced to 16,000 and 15,000 respectively. Controversies in reference to these seal-fisheries arose between the United States, England and Russia. The questions were referred to arbitrators who met in Paris in 1893. In 1896 the United States and Great Britain each appointed a commission to study the life of the seals and the causes for their decline in numbers. The members of the American commission reached the conclusion that the decline in the herds is due to killing females in the open sea, where the sex cannot be readily distinguished. This form of capture should be abandoned, and the hunt for skins should be confined to killing on the land and restricted to three-year-old males. See Allen's *Fur-Seal and Other Fisheries of Alaska* (Washington, 1889), and Jordan's *Report of the Fur Seal Investigations* (Washington, 1898).

Seal'ed Orders are orders which are delivered to the commanding officer of a ship or squadron, sealed and only to be opened when at sea. The commanding officer of a ship or squadron is sent to sea under sealed orders when sailing on any secret service, to prevent the destination and object of the expedition from becoming known. The commander, equally with all under him, is ignorant of where he is to sail or what he is to do until the seal is broken.

Seal'ing-Wax. Before ordinary sealing-wax was known in Europe, colored bees-wax was used for sealing letters and docu-

ments. Sealing-wax was probably first made in India or China. The best red sealing-wax is made of shellac, Venetian turpentine and vermilion to which is often added magnesia, chalk or gypsum. In parcel-wax the main ingredient is common resin.

Seasons (*sē'z'nz*). The motions of the earth on which the seasons depend are explained in EARTH. The chief cause of the greater heat of summer and the greater cold of winter is that the sun's rays fall more obliquely on the earth's surface in the latter season than in the former. Another cause is the greater length of the day in summer and of the night in winter. In the tropics the sun's rays always are so nearly direct that no one part of the year is sensibly colder than another. But the zone of calms, in which the rainfall is almost continuous, moves northward with the sun in the northern summer and southward in the southern summer. As the wet zone follows the sun, the regions it crosses have wet and dry seasons. In the arctic and antarctic regions spring and autumn are very short, the year dividing itself simply into a long winter and a short summer. In temperate regions the year is naturally divided into spring, summer, autumn and winter. The almanacs assume that spring begins at the vernal equinox, March 20; summer at the summer solstice, June 21; autumn at the autumnal equinox, Sept. 21; and winter at the winter solstice, Dec. 21. However, the greatest heat is reached sometime after the summer solstice, the time when the sun's rays are most nearly vertical and the day is longest. In like manner the greatest cold of winter comes after the winter solstice the time when the day is shortest and the sun's rays most oblique. The reason in the former case is that, as summer comes on, the earth itself becomes more heated; in the latter, that it keeps a part of the heat which it had got in summer, just as the warmest part of the day is a little after midday and the coldest part of the night is toward morning.

Seath, John, was born in Fifeshire, Scotland, in 1844. He obtained his degree in arts at Queens College, Belfast, winning prizes and a medal. He moved to Canada in 1861, and in 1862 was appointed headmaster of Brampton High School (Ontario). For ten years (1874–84) he was head-master of the Collegiate Institute at St Catherines, and in 1884 he was appointed inspector of high schools. He is the author of a grammar for senior scholars and of a school-edition of Milton, and is senator of the University of Toronto. Mr. Seath's services to the cause of education in Ontario can scarcely be adequately valued. Especially in the cause of secondary education has he been privileged to do lasting good. He now holds the position of superintendent of education for the province.

Seat'tle, Wash., a port of entry and largest city of the state, is the county-seat of King County. Rising from the shores of Elliott Bay on the west, the city covers numerous hills, embraces Lake Union and Green Lake within its borders, and reaches on the east to Lake Washington, a beautiful body of fresh water 22 miles long and from one to three wide. The business district is substantially built in the manner of a progressive, modern city; the hills are covered with handsome homes and attractive cottages; the parks and boulevards are being made into a system of rare beauty and extent; and the scenery afforded by the combination of lakes, sound and mountains is striking and beautiful. Public buildings, prominent among which are the library and the new Federal building; schools and educational institutions, as the high schools and the University of Washington; houses of worship, with the Roman Catholic cathedral and the new First Presbyterian church as conspicuous edifices; and good hotels, theaters and club-houses are numerous. The school-system is excellent, the buildings fine, and textbooks are furnished free. Higher educational institutions consist of the University of Washington; the College of the Immaculate Conception (R. C.); Holy Name Academy (R. C.); and Seattle Seminary (M. E.). Transportation facilities, position as a distributing point both for domestic and for foreign markets, supply of fuel and cheap power and raw material for various lines of industry are causing Seattle rapidly to become a manufacturing center. Among the chief industries are ship-yards, flour and rolling mills, shingle and lumber mills, foundries, iron-works, fishcanning and woodworking.

Piers for handling ocean and land traffic line the front of Elliott Bay. The commerce of the port has advanced with astonishing rapidity, and it has grown still faster since the connection of Lakes Washington and Union with Puget Sound by means of a canal capable of floating the largest ships was completed. King County raised money for the building of this important aid to its commerce by levying a tax on a specially created assessment district, authorized by the Legislature. The canal, which gives to Seattle a fresh-water harbor unexcelled, was built in accordance with plans made by the national government. The bulk of the Alaskan trade passes through Seattle.. Several lines of steamships, including the largest freight-carrier in the world, ply regularly between Seattle and the Orient and other parts of the world, particularly to the countries bordering on the Pacific. The Northern Pacific and Great Northern railways have vast terminal facilities, while the Union Pacific and Chicago, Milwaukee

and Puget Sound, have acquired holdings almost equally large. The Burlington and the Canadian Pacific reach the city by traffic arrangements with existing transcontinental systems.

The water-plant is owned by the city, and water is supplied by Cedar River and Cedar Lake. From the fall of Cedar River power is obtained to operate the lighting-plant, which is also owned by the municipality. Seattle has a fine street-car system and all modern improvements. Excellent interurban lines radiate into surrounding territory and connect the city with Tacoma and Everett. Seattle was settled in 1852, laid out in 1853, and named in honor of a noted Indian chief. It incorporated in 1865 and re-incorporated in 1869. In 1880 it had a population of 3,533; in 1910 this had become 237,194.

Sea'weeds. See ALGÆ.

Sebastian (*sê-băs'chan*), **St.,** a martyr of the early church, was a native of Narbonne. Under Diocletian he became a captain of the prætorian guard and secretly a Christian. It came to the ears of Diocletian that Sebastian encouraged those who were being led out to death for being Christians; so the emperor had his captain tied to a stake and shot by archers. But they did not wholly kill him; a pious woman named Irene took him away and tended his wounds. As soon as he recovered, Sebastian boldly faced the tyrant and upbraided him for his cruelty. Diocletian then ordered him to be beaten to death with rods (about 288 A. D.). His first martyrdom — a young and handsome soldier bristling with arrows — was a favorite subject for the Italian religious painters, as Mantegna, Veronese and Domenichino.

Sebastopol (*sê-băs'tō-pŏl'*), a Russian seaport and fortress, is near the southwestern end of the Crimea, on the southern side of one of the finest harbors in the world. The place is celebrated for its long siege by the French, Turks and English in the Crimean War of 1854-5. The town and harbor were defended by forts of immense strength, built of limestone faced with granite, on which artillery made little impression. On the land-side the earthworks and fortifications raised by General Todleben kept the armies of France and England at bay for 11 months. But the capture of the Malakoff and Redan works at length forced the Russians to evacuate the lines. The town was mined and the docks and forts blown up by the allies. The fortifications and docks have since been rebuilt. The imports are mainly cotton and coal: the exports, grain. The town was founded in 1783 under orders of Empress Catharine II. Population 53,595, including a garrison of 12,000. See Leo Tolstoi's *Sebastopol.*

Secord, Laura, a heroine of the war of 1812. On June 23, 1813, Col. Boerstler, U. S. A., with 550 men and two cannon, advanced upon the little outpost at Beaver Dam near old Fort George. News was borne to the garrison under Lieut. Fitzgibbons by Laura Secord, whose husband lay wounded in Queenston. She set out at dawn, driving a cow by way of pretext to pass the American sentry, ran and walked through the wildest of woods for 20 miles, and late in the day arrived with her intelligence. As a result 200 Indians succeeded in ambushing Boerstler's command, which surrendered, laying down their arms to a British lieutenant with 260 Indians, militiamen and regulars.

Sec'retary-Bird, a large bird of South Africa, receiving its name from the arrangement of a number of black and gray quills over the ear, in the position of a clerk's pen. It belongs with the birds of prey, but on account of its long legs, has been classed with the wading birds. From its eating snakes it has also received the name of the serpent-eater. The bird is about four

SECRETARY-BIRD

feet long from bill to tip of tail, which is about two feet long. The legs and neck are both long, and the body makes up only a small part of the bird. The general color of the plumage is clear gray. They are shy in their native haunts, but have been domesticated by Cape Colony farmers. Their

favorite food seems to be frogs and toads, but lizards and many snakes are devoured. The nest is built high up in a tree, and two or three, large, white eggs are deposited. On the ground the bird walks with a stiff military gait, but can run with great swiftness.

Secre'tion (in plants), in its broadest sense, the process by which substances are separated from the protoplasm; also the substances so separated. In this sense the cell-wall and starch-grains are secretions, since they are formed by the protoplasm and separated from it. The term is usually applied, however, to waste products (sometimes distinguished as excretions) or to products which have some special function, *e. g.*, enzymes (*q. v.*) and nectar. The number and variety of secretions are very great. Some are formed in a special cell or group of cells, constituting a gland, which may be on the surface (*e. g.*, in geranium leaves) or may adjoin an internal space into which the secretion is poured (*e. g.*, resin-glands of pines). In other cases the secretion accumulates in the gland-cells, which finally die, leaving a mass of the secretion occupying their room, *e. g.*, in orange-rind. The methods by which the secretion is put forth from a cell are not known.

Seda'lia, Mo., in the center of the state, is surrounded by a fertile, prosperous agricultural district. Its industries comprise two railway shops, a packing house, a foundry and implement factory, and manufactories of clothing, candy, carriages, wagons, cigars, beer, ice, carbonated drinks, butter, etc. Its transportation facilities consist of two trunk lines and three branch railroads. There are three colleges, a high school and 12 ward schools in Sedalia. Population, 25,000.

Sedan (*sê-dăn'*), a town and frontier fortress of France, stands on the Meuse, 64 miles northeast of Rheims. The citadel surrendered to the Germans in 1815; but Sedan is chiefly noted for the surrender, Sept. 2, 1870, of Napoleon III and 86,000 men to the Germans in the Franco-Prussian War. The Germans, under the command of King William of Prussia, began the battle on September 1. By manœuvers and hard fighting the French under Marshal MacMahon were driven from all sides to the fortress, where, defeated, surrounded and without provisions, they were forced to surrender. The emperor was sent a prisoner to Wilhelmshöhe, and two days later Gambetta proclaimed the republic at Paris. Colbert founded at Sedan cloth-mills, which now employ 10,000 men. Sedan-chairs were named from this town, where they are said to have been invented. Population 19,350.

Sed'don, Richard John, premier and treasurer of New Zealand and minister of labor, defence, education and immigration, was born at Eccleston, Lancashire, England, in 1845, and educated there. He went to New Zealand in 1867. A mechanical engineer by profession, he had an intimate acquaintance with workingmen and their needs, and was continuously in public service after entering its house of representatives in 1879. His death occurred on June 10, 1906.

Sedge, the name of a family of plants, one class of which contains over 200 kinds in North America. They are mostly found in swamps and other wet places, forming often thick tufts. The stems are solid and triangular. Sedges are most common in cold countries. They differ in some important respects from grasses, especially in being worthless as pasture or food plants.

Sedg'wick, Catherine Maria, American novelist and writer, was born at Stockbridge, Mass., Dec. 28, 1789, and died near Roxbury, Mass., July 31, 1867. She was the daughter of Theodore Sedgwick (1747-1813), the Federalist politician and jurist. She herself is noted as one of the earliest of American women of letters, a contributor to the *Annuals* in vogue early in the literary history of the United States, and a voluminous and entertaining writer of moral tales and miscellanies. Her chief works embrace *A New England Tale; Redwood*, reprinted in England and appearing in three or four European translations; *Hope Leslie;* and *Linwoods*.

Sedgwick, John, was born at Cornwall, Conn., Sept. 13, 1813. A West Point graduate, he served in Florida as second-lieutenant when the Cherokees were removed. He also served through the Mexican War, gaining promotion at Contreras, Churubusco and Chapultepec. His record in the Civil War was brilliant. By the spring of 1862 Sedgwick was in command of a division, and in July of that year was made major-general of volunteers. As commander of the 6th or Sedgwick's corps, as it was called, he made a forced march of 35 miles to Gettysburg, and there commanded the left wing in the battle. Three days after the battle of the Wilderness, May 5 and 6, 1864, in which he had taken part, he was shot by a sharpshooter while ordering a battery to be brought into position. See MacMahon's *Address on Major-General Sedgwick.*

Seebeck (*zā'bĕk*), **Thomas Johann,** a German physicist, born April 9, 1770, at Reval, died on Dec. 10, 1831, at Berlin. Seebeck will be remembered principally for his very important discovery of thermo-electric currents sometimes called the Seebeck effect. This is the converse of the Peltier effect (See ELECTRICITY.) For an excellent account of these two "effects" see J. J. Thompson's *Elements of Electricity and Magnetism*, ch. 14.

Seed-Disper'sal is the scattering of plant reproductive bodies, especially seeds and the seed-vessels (see FRUITS) containing them, by wind, water, animals and other agencies. The benefit to the plant is in

getting away from the parent plant and getting a foothold in soil not already exhausted of those elements needed by that particular species. These bodies may be carried by the wind by being light or by having sail-like or feathery appendages on the seed, as the milkweed and catalpa, or on the seed-vessel, as the maple and dandelion. Spines or hooks, usually a part of the seed-vessel, fasten to birds or other passing animals, as is done by the burdock and stick-tights. Indigestible seeds of edible fruits are carried by birds. Seeds are carried by mud clinging to the feet of water-birds. For other methods of spreading than by seeds, usually considered in this connection, see PROPAGATION. Consult Beal's *Seed-Dispersal.*

Seed-Plants. The common name of Spermatophytes (*q. v.*).

Seeds. In general a seed is a transformed ovule, and an ovule is an megasporangium (*q. v.*). The transformation is connected with the process of fertilization. The most apparent effect is the development of the hard coat or *testa*, which has to do with the protection of the delicate structures within. This *testa* is usually formed in connection with the integument of the ovule. Within the seed-coat the essential thing is the embryo (*q. v.*). Around the embryo may be deposited more or less endosperm (*q. v.*), and outside of the endosperm, in some seeds, is the perisperm (*q.v.*). A seed is well-devised for carrying a plant through an unfavorable season of drought or cold. The length of time a seed may retain its vitality and be made to germinate is known only in the most general way. The old story of the germination of wheat derived from mummies in Egypt was contradicted almost as soon as it was started, but the contradiction has never yet overtaken the original statement. That seeds may endure for several, often for many, years and then be made to germinate is well-attested, but the data are very uncertain. Seeds must be carried out of reach of rivalry with the parent-plant and with each other. Various agencies have been used to effect this dispersal: (1) *Currents of air.* The wind transports numerous seeds, which have been prepared for this agency in a variety of ways. Some have tufts of hair, others plumes, others wings. Often it is the fruit rather than the seed which bears the tuft of hairs (as thistle) or the wings (as maple), but the result is the same. (2) *Currents of water.* Many seeds may be carried long distances by water and still be able to germinate. The banks and flood-plains of streams constantly receive seeds from the regions toward the headwaters, and the more extensive the area drained by a stream the more varied is the collection of seeds on its flood-plain. The oceanic currents probably carry seeds the greatest distances, transporting them from continents to islands, even from continent to continent. By experiment Darwin found that numerous seeds could be soaked in sea-water long enough to be carried over 1,000 miles by an oceanic current without losing the power of germination. (3) *Animals.* Many seeds and fruits develop grappling appendages of various kinds, by means of which they adhere to animals brushing past, as the tickseed, Spanish needle etc. Migrating birds, especially those which visit marshy shores, are great carriers of seeds which are imbedded in the mud adhering to their feet. Fruit-eating birds also transport seeds, which may pass through the alimentary tract without losing the power of germination. (4) *Explosive fruits.* In some cases fruits have the power of forcibly discharging their seeds, as the violet, witch-hazel, touch-me-not etc. This method is interesting, but not so effective as the others, since the distance traversed is necessarily very limited.

JOHN M. COULTER.

Seeley (*sē'lĭ*), **John Robert,** an English historian born in 1834, who died in 1895, was the author of notable books, historical and religious. He held a professorship at University College, London, and in 1869 was appointed professor of modern history at the University of Cambridge. His writings embrace a *Short History of Napoleon I, Lectures and Essays, Life and Times of Stein, The Expansion of England, Natural Religion* and *Ecce Homo.* This, his most celebrated book, studied the life and character of Jesus as a human being.

Seidl (*zī'dl*), **Anton H.,** an Austrian musical conductor, was born at Buda-Pest, Hungary, May 7, 1850, and died at New York, March 28, 1898. After studying at Leipsic under Richter and at Baireuth under Wagner, he became conductor of Leipsic Opera-House, and in 1882 made a tour of Europe as conductor of Neumann's Nibelungen troupe. In 1883 he was appointed conductor of the opera-house at Bremen, and two years later came to the United States, where he was received with favor in New York and other cities, as leader of German operas and as successor to Theodore Thomas in conducting the concerts of the New York Philharmonic Society. He was the notable exponent, for many years, in this country, of Wagner's music.

Seine (*sān*), one of the four chief rivers of France, rises northwest of Dijon and flows northwestward, with many windings, past Fontainebleau, Melun, Paris, St Denis, St. Germain and Rouen for 482 miles, falling into the English Channel at an inlet where stand the ports of Harfleur and Havre. It is navigable 350 miles from its mouth, or to Marcilly, and the improvement of the upper Seine as a canal is one of the schemes proposed to join Paris to the Atlantic. Its

main branches are the Aube, Marne, Oise, Yonne, Loing, Essonne and Eure; and canals join it to the Somme, Scheldt, Meuse, Rhine, Sâone and Loire. Deep dredging from Rouen, through the inlet at its mouth, has made that city a seaport and has reclaimed 28,000 acres of land. The situation of Paris on the Seine has made this, like the Hudson and the Thames, one of the famous rivers of the world. See Vernon-Harcourt's *The Seine*.

Seismol'ogy. That branch of physical science which is concerned with the investigation of earthquakes,— their causes and effects, their distribution and the various circumstances attending their occurrences. Professor John Milne suggests that, in addition to what are generally known as earthquakes, seismology should investigate earth-tremors which escape attention by the smallness of their amplitude; earth-pulsations overlooked on account of the length of their period; and earth-oscillations or slow and quiet changes in the relative level of the sea and land, which geologists speak of as elevation and subsidence. But seismology is a very new science, having been developed almost wholly during the nineteenth century and being regarded as yet in the early stages of its development. Its pursuit is regarded, however, as of the utmost importance to geological and other forms of terrestrial research. It already has a great and growing body of material and literature. It is hoped that soon practical applications of the science will be developed; one of these, it is confidently predicted, will be the warning to dwellers in unstable regions when earthquakes or similar disturbances impend. Milne is sanguine that earthquake warnings will be as common and as trustworthy as the storm warnings at our seaports. The value of such warnings is beyond estimate. In Japan, where earthquakes are frequent, an earthquake-investigation committee was formed in 1892 and has been investigating the practical aspects of seismology very carefully. Professor Gerland, director of the imperial German chief station for earthquake investigation at Strassburg, now issues an annual catalogue of earthquakes, and in 1903 organized The International Seismological Association. The interest is growing in America, and the broad extent of our outlying territory gives us fine advantages in collecting data. These earth-movements are recorded by seismographs, instruments found in many modern observatories. They are, essentially, a pillar extending well into the earth to gather the vibrations, with an additional device for recording them. There is wide variation in detail of construction; but the instrument traces a continuous curve, the variations of which indicate the intensity, distance, time, and duration of the shock. Professor Milne's instrument on the Isle of Wight detects disturbances in Japan, Borneo or South America.

Seis'mograph. See SEISMOLOGY.

Seismometer (*sīs-mŏm'ĕ-tĕr*), an instrument which is used to measure the amount and direction of displacement at any point on the earth's surface during an earthquake. The name is also applied to those devices by which the slow and gradual tilting of the earth's surface is indicated.

For the first of these two purposes the one thing essential is to place a body in neutral equilibrium and without friction. To realize these two conditions perfectly is of course impossible. But they can be very nearly approximated. Thus an open gate, with a heavy mass at its outer end, rotating about a strictly vertical axis with very minute friction, would fairly represent a seismometer. Three instruments of this kind, one free to move east-and-west, one free to move north-and-south and one free to move in a vertical direction, will give the three components of any motion produced by an earthquake; and by compounding these three motions we can obtain the original motion. In the modern instruments, as perfected by Prof. John Milne, these records are automatically photographed.

Seismometers which are employed to measure the tilting of the earth's crust generally use a beam of light which has been reflected, part of it from a mirror rigidly attached to the earth, and part of it from a surface of mercury, which remains horizontal whether the earth's crust is tilted or not. The variation in angle between these two beams measures the tilting of the earth. See Milne's *Earthquakes* in the International Scientific Series and Geo. H. Darwin's *Tides*, popular lectures before Lowell Institute, Boston, Mass., in which earth-tiltings are treated.

Seja'nus. See TIBERIUS.

Selaginella (*sĕl'ă-jĭ-nĕl'lă*), the genus of plants to which the "little club-mosses" belong. See LYCOPODIALES.

Selenium (*sē-lē'nĭ-ŭm*) is a very rare element which exists in two forms. In the glassy form at ordinary temperatures it is a solid of a dark-brown color and a non-conductor of electricity. When it is slowly cooled from its melted condition, it does not appear vitreous or glassy, but crystalline, of a dull leaden color, and at ordinary temperatures is a conductor of electricity. It is very sensitive to light, and its electrical resistance is much less in the light than in the dark. This property led to the discovery of the photophone in 1880. Selenium is found chiefly in combination with lead, silver, copper or iron; but it has also been found in sulphur and certain iron sulphides. Selenium was discovered in 1817 by Berzelius in the waste of a sulphuric-acid factory.

Seleucia (*sē-lū'shĭ-ă*), the name of several early cities.

Seleucia-on-the-Tigris was built by Seleucus Nicator, 40 miles northeast of Babylon, as the successor of that capital, which was despoiled to furnish it with building material. It grew fast, and at one time had a population of 600,000. It was partly burned by Trajan and razed to the ground by Avidius Cassius in 162 A. D. in the reign of Marcus Aurelius and Lucius Verus.

Seleucia Pieria (*pī-ē'ri-ā*), founded by Seleucus Nicator, near the mouth of the Orontes in Syria, was the seaport of Antioch. It was a city of importance during the wars between the Seleucidæ and the Ptolemies for the possession of Syria. A remarkable tunnel, 1,088 yards long, dug out of the solid rock, the only connection between the city and the sea, and the ruins of its threefold line of walls, fortress, temple and amphitheater speak of its former splendor.

Seleucidæ (*sē-lū'sĭ-dē*), the royal house to whom fell Syria, a large part of Asia Minor and Persia, Bactria and other eastern provinces of Alexander the Great. Seleucus Nicator was driven to Egypt by Antigonus. The date of his return to Babylon, 312 B. C., was the beginning of the Seleucian empire. Susiana, Media and the provinces as far as the Oxus and the Indus fell into his hands. Joining the confederacy headed by Ptolemy, he gained Syria, and later all Asia Minor fell to his share on the defeat of Antigonus by the allies. Planting Greek colonies and founding many cities — some of which, as Seleucia-on-the-Tigris and Antioch, became among the largest and richest in the world — were some of his plans to create a great empire. Seleucus was murdered by one of his officers in 280 B. C. Antiochus II allowed the great Parthian kingdom to rise in the east. The two ablest successors of Seleucus I were Antiochus III, the first great eastern king to come into collision with the Romans, and Antiochus IV, whose cruelties would have perhaps succeeded in supplanting the Jewish religion by the Greek worship, had it not been for the patriotic resistance of the Maccabees (*q. v.*). Antiochus died a raving lunatic. In derision his subjects changed his surname of Epiphanes or the Illustrious into Epimanes or the Madman. Syria, the last Seleucian possession, was conquered by Ptolemy in 65 B. C.

Self-Activ'ity. In the process of education there seem to be two principal factors. On the one hand are the instincts, impulses and interests of the individual, whether child or adult; and on the other hand are certain sensations and stimuli which operate from without. The name of *self-activity* is given to the native tendencies of the individual. These include instincts, impulses and interests. Every instinct, indeed, involves an impulse and tends to create an interest. The factor of self-activity in the process of education has been chiefly emphasized by the school of Froebel. By Froebel self-activity was regarded as the divinely set spark of the fire of life or the seed of all development. It was regarded as a datum of unity in the soul. However, it is a question whether one should speak of self-activity or only of *self-activities*. An analysis of self-activity would seem to involve something like the classification of instincts by Professor James in *Principles of Psychology*. Self-activity would then involve not only the natural physical tendencies but the inclinations towards imitation, emulation, pugnacity, sympathy, hunting, fear, acquisitiveness, constructiveness, play, curiosity, sociability, shyness, secretiveness, cleanliness, shame and love. It seems absurd to regard these self-activities as reducible to a single type and equally absurd to regard them as wholly independent of one another. It follows that original self-activity is neither a mere unity nor a mere set of different activities, but rather a germ both of unity and of difference. This is important for the theory of the will. The will is partly given and partly achieved. The will, indeed, simply is the unity of self-activity. Self-activity, therefore, is encouraged in education as the basis of will, effort and interest. It seems to be best developed by its own exercise. Such occupations as manual training, which involve doing rather than imitating, are therefore regarded as concessions to the doctrine of education by self-activity. Education by self-activity practically is education by development. The nature of the child is followed and not constrained. Yet it is clear that the child has to meet certain social demands. These demands are represented by the curriculum, which must be mastered. The curriculum itself can only to a limited extent cater to self-activity. It is method, therefore, rather than curriculum, which is founded upon a study of self-activity or upon child-study. Education according to self-activity emphasizes child-nature, individuality, psychological method and the principles of heredity. In general, the treatment of self-activities in education should be sympathetic but not servile. The teacher is not to eliminate them, as if they represented original sin; but he is not to pander to them where duty demands a sacrifice. They are not to be destroyed, nor yet followed; they are to be guided and controlled according to the social conception of the good.

Self-Pollina'tion (in plants), the transfer of pollen from a stamen to the stigma of the same flower. It is the same as close-pollination. See Pollination.

Se'lim I. sultan of Turkey, was born in 1467, dethroned his father, Bajazet II, by the aid of the janizaries in 1512, and put his father, brothers and nephews to death. In 1514, after massacring 40,000 Shiites, he declared war against Persia and defeated Shah Ismail near Tabriz. Three years later

he wrested Egypt from the Mamelukes and annexed Syria. He also forced the caliph of Cairo to yield the headship of the Mohammedan world and the standard of the prophet. The sacred cities of Mecca and Medina, also fell into his hands. This able yet savage ruler, however, improved the condition of the people he had conquered, kept the janizaries in order, and was a lover of literature. He died in 1520.

Seljuks (*sĕl-jūks'*), a division of the Ghuzz confederacy of Turkish tribes. Togrul Beg, grandson of Seljuk, founder of the dynasty, crippled the empire of Ghazni (1040), conquered Persia and, ten years later, Baghdad. Togrul's nephew and successor, Alp-Arslan, wrested Syria and Palestine from the caliph of Egypt, and in 1071 captured Diogenes, the Byzantine emperor. Diogenes' ransom was the best part of Asia Minor. The empire at the close of this reign (1092) began to break up into smaller kingdoms. Even before this, strong chieftains like Saladin had been really independent. In the 13th century the orders of *dervishes* arose, and the Mongols began to gain the power which they wielded over this part of Asia till the rise of the Ottoman princes, who, like the Seljuks, were Turks and had been driven westward by the Mongols. Out of their supremacy grew the Turkish empire (*q. v.*).

Sel'kirk, Alexander. See JUAN FERNANDEZ.

Selkirk Mountains, an outlying range of the Rocky Mountains, in British Columbia, reaching southward almost to the United States boundary. The range contains enormous glaciers, and is the home of bears, big-horned sheep and Rocky Mountain sheep. See W. S. Green's *Among the Selkirk Glaciers.*

Sel'ma, Ala., city and county-seat of Dallas County, on Alabama River, 50 miles from Montgomery. The city is in the fertile black belt section of the South where cotton and live stock are extensively produced. It has cotton factories, a cotton-warehouse, cotton-seed-oil mill, car-wheel shops, ironworks and railroad machine shops. Selma has a Carnegie library, Dallas Academy, Selma University (Baptist), opened in 1878, for colored pupils, private business schools, the Y. M. C. A. library and reading-rooms. During the Civil War the city had a Confederate navy-yard, arsenal, powder-works and artillery-foundries. It was captured by the Union forces on April 2, 1865. Selma has the service of three railroads, and is at the head of year-round steamboat navigation on the Alabama River. The population is 13,649.

Selous', Frederick Courteney, African explorer and hunter, was born in London, Dec. 31, 1851, and educated at Rugby and in Switzerland and Germany. He left England for South Africa in July, 1871, went to Matabeleland the year after, and supported himself for 19 years by elephant-hunting and collecting natural history specimens. In 1890 he guided the pioneer expedition to Mashonaland, and in 1892 took part in the first Matabele war. He was awarded the Cuthbert Peek grant, the Back premium and the Founder's gold medal by the Royal Geographical Society, and was a corresponding member of the Zoölogical Society. His published works include *A Hunter's Wanderings in Africa, Travel and Adventure in Southeast Africa, Sunshine and Storm in Rhodesia* and *Sport and Travel.* He died in 1917.

Selwyn (*sĕl'wĭn*), **Alfred Richard Cecil,** was born in Kilmington, Somerset, July 28 1824, and educated partly in Switzerland. His pursuit of his favorite science began officially in 1845 when he was appointed assistant-geologist on the geological survey of Great Britain, a post he resigned in 1852 to accept that of director of the geological survey of Victoria. In 1869 he came to Canada as director of the Canadian geological survey, a post he held until 1895. He wrote the Canadian part of Stanford's *Compendium of Geography,* and was the editor of and an important contributor to the annual reports of the survey of Canada from 1869 to 1894. He died in 1904.

Sem'aphore. This is an apparatus for visible telegraphy by means of flags, lanterns or similar signals It is employed in connection with the block-system (*q. v.*) on railroads and at sea by means of flags. Different combinations of the flags, lanterns or movements of signal-arms may serve to indicate the different letters of the alphabet. Sometimes they are used to indicate numbers. Semaphores are of importance not only to indicate the movements of trains and shipping; but in war-signaling, when special codes are employed.

Sembrich (*zĕm'brĭk*), **Marcella.** (Real name, Praxede Marcelline Kochanska). An Austro-Polish opera-singer, born at Lemberg in Galicia, Feb. 15, 1858. She first studied violin and piano, her master on the latter being Franz Liszt. When her remarkable voice was discovered, she went to Milan to study with Lamperti. She made her début in opera at Athens in *I Puritani* in 1877. Soon she became attached to the company of the Royal Opera-House, Dresden, remaining till 1880. That year she first appeared in London. She became a great favorite in the characters of Terlina, Susanna, Constance,

MARCELLA SEMBRICH

Martha and Lucia. She came to the United States in 1883, and has appeared here in several seasons of concert and opera work. She retired from active work on the stage in 1900, but continues to sing occasionally in concerts.

Semele (*sĕm'ê-lē*), in Greek story, was beloved by Zeus, and Hera, moved by jealousy, persuaded her to ask him to appear in all his majesty as king of gods and men. Having sworn to grant her every request and warned her in vain not to press her wish, he unwillingly yielded and appeared as the god of the thunderbolt. Semele was consumed by the lightning, but the child to which she was about to give birth was saved by Zeus. This child was Dionysus, the god of wine.

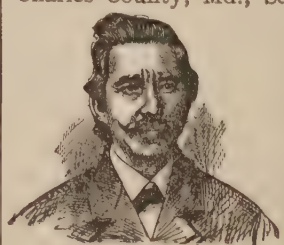
Seminoles (*sĕm'ĭ-nōlz*), at first a wandering branch of Creek Indians. In 1817 they joined the Creeks and some refugee negroes in ravaging the white settlements in Georgia, plundering the plantations and carrying off slaves whom they refused to surrender. Andrew Jackson was sent to punish them, and his expedition hastened the cession of Florida to the United States (1819). The Seminoles, numbering 4,000 in 1823, by a treaty made in that year sold most of their lands for a yearly sum. In 1832 a treaty for the removal of the whole tribe west of the Mississippi was signed by the chiefs, but the tribe, under the leadership of Osceola, would not ratify it. This led to a war, lasting seven years and costing hundreds of lives and millions of dollars. At length the tribe was removed to Indian Territory (now Oklahoma), where are now settled all the Seminoles, some 3,000, except about 200 still lingering in Florida and a few in Texas. The Seminoles are steady, sober and industrious, and in the progress they have made rank next to the Cherokees, Creeks and Choctaws. They receive $25,000 a year, besides money to keep up their schools and government. They cultivate about 8,000 acres. They have eight churches, and are under the training of Presbyterian missionaries.

Semiramis (*sĕ-mĭr'ă-mĭs*), wife of Ninus, who, according to the Greek historians, founded Nineveh. A daughter of Derceto, the fish-goddess, she was exposed to death when a baby, but miraculously fed by doves and brought up by a shepherd. Onnes, one of the king's generals, charmed by her beauty, married her; but she won the heart of the king himself by her heroic capture of Bactra, whereupon her husband had the loyalty to take his own life. Ninus soon died, leaving Semiramis to reign gloriously for 42 years, conquering in Persia, Libya and Æthiopia, but failing in her attack on India, where her army was cut to pieces by elephants. She at last disappeared, according to some stories, in the form of a dove. The name of the mighty queen survived in the names of many great works, as the hanging-gardens of Babylon, which were attributed to her. The Semiramis of the North was the name aptly given to Catherine II of Russia.

Semites (*sĕm'ītes*), a name applied to a group of nations, much alike in language, religion, manners and looks, who are represented in *Genesis x* as descended from Shem, a son of Noah. Their home is Abyssinia, Arabia, Palestine, Phœnicia, Syria and the countries of the Euphrates and Tigris. It is generally believed that as early as 4000 B. C. the Semites migrated as wandering tribes, probably from Arabia, into Mesopotamia. There they found a people dwelling in cities built of brick, under a regular government of priest-kings, skilled in metals and using cuneiform (*q. v.*) writing. Accad, Shumir and Elam were conquered, the Semites forming the upper classes of society and ruling the Akkadians and Sumerians. Chedorlaomer, a king of Elam, about 2200 B. C. conquered as far as Palestine. Some Semites migrated northwestward and founded Tyre, Sidon and other cities on the Mediterranean, and became known as Canaanites and Phœnicians. Later, others came from Ur and founded the nation of Israelites. Still others built cities which grew into the Assyrian empire.

The Semites as a race have finely-developed bodies, quick and clever minds, but are not inclined to change. Almost their only arts are the sculpture of Assyria and the glass, pottery, cloth and embroidery of the Phœnicians. They have made their mark on the world in the Phœnician commerce and colonies; in the Carthaginian empire and the exploits of Hannibal; in the spreading of the Phœnician alphabet, which is the mother of the European and most Asiatic alphabets, though it is not the oldest alphabet; in the Babylonian and Assyrian empires; in the Hebrew Bible and Jewish religion; in the New Testament and Christian religion; in the Koran and Mohammedan religion; in the Mohammedan conquests and empire; and in the preservation of learning through the dark and middle ages.

Semmes (*sĕmz*), **Raphael,** was born in Charles County, Md., Sept. 27, 1809. He entered the navy in 1826, and became a commander in 1855. He served during the Mexican War as a naval officer and also as an aide to General Worth. As commander of the Confederate steamer *Sumter*, he ran the blockade at the mouth of the Mississippi at the beginning of the Civil War. After capturing several



RAPHAEL SEMMES

merchant-vessels in the Gulf of Mexico, he sailed to England. On leaving Southampton he was pursued by the Federal steamer *Tuscarora*, blockaded at Tangier, and forced to sell his ship. In August, 1862, he took command of the famous *Alabama*, built in England and manned by an English crew. He then commenced a successful cruise against merchant-vessels. He also sank the gunboat *Hatteras* off Galveston; but on June 19, 1864, the *Alabama* was herself sunk by the *Kearsarge* in a sea-fight off the harbor of Cherbourg, France. Semmes, however, escaped in an English yacht. He opened a law-office at Mobile after the war closed, but was arrested and suffered a four months' imprisonment. He afterwards wrote and lectured on his adventures during the war. Semmes died at Mobile, Ala., Aug. 30, 1877.

Sempach (*zĕm'pāk*), **Battle of.** See WINKELRIED, ARNOLD VON.

Seneca (*sĕn'ĕ-kā*), whose father was a prominent writer, was a Spaniard, born at Corduba (Cordoya) about 4 B. C. He studied law at Rome, where he narrowly escaped being put to death by Emperor Caligula. Later in life he entered the Roman court, but in 41 A. D. lost the favor of Claudius and suffered eight years' banishment to Corsica. After his return he became tutor to Nero, over whom he had a strong and good influence, and was made consul in 57 A. D. by his pupil, who was now emperor. As Nero (*q. v.*) rapidly sank into crime, Seneca's high moral character aroused hatred, while the teacher's wealth, heaped on him by Nero, is said to have made the emperor jealous. Nero tried to poison him, but, failing in this, had him drawn into the Pisonian conspiracy, for which he was tried and condemned. Left free to choose his own death, he opened his veins and bled to death, 65 A. D. Seneca was a noble and upright man, yet had many enemies. *On Foresight*, *On Shortness of Life* and *Epistles to Lucilius* are some of his writings, besides epigrams and eight tragedies, which show great mastery of style but are unfitted for the stage. For a striking portrait of Seneca see Hugh Westbury's *Acté*. Consult, also, Farrar's *Seekers after God* and the *Quo Vadis?* of Sienkiewicz.

Seneca Falls, N. Y., a village in Seneca County, on Seneca River, the Seneca and Cayuga Canal and the N. Y. Central and Lehigh Valley railways, about 40 miles west of Syracuse. It lies in a notable agricultural region, and was early settled; it also has extensive manufactories, which in large measure utilize the waterpower of the river. Among these are pump, fire-engine, automobile, button and machine-tool works. It is the seat of Johnson Home for Indigent Females, Mynderse Academy and Library and Rumsey Hall, a preparatory school; while in the vicinity it has a fine summer-resort in Cayuga Lake Park. Population 6,588.

Seneca Lake, one of a range of narrow lakes in the western part of New York. It is 36 miles long, and averages two miles in width and 530 feet in depth. Steamboats ply daily from end to end. It flows into Lake Ontario through Seneca and Oswego Rivers, and is joined by canal to Erie Canal.

Senecas, one of the Indian tribes. See IROQUOIS.

Sénégal (*sĕn'ĕ-gal'*) is a French colony on the western coast of Africa between Gambia River and the Sahara. It extends 900 miles inland, covers 80,000 square miles and has 1,200,000 inhabitants. The colony is under civil administration, and comprises the communes of St. Louis, the capital; Dakar, a fortified naval station that is the seat of the general government of French West Africa; Rufisque; and Gorée. These are directly under the governor, and the inhabitants, numbering 107,826, are French citizens and elect a deputy to the Parliament at Paris. The colony also includes nine circles under other administrators, where the natives are not citizens of France, and other districts that govern themselves under French protectorates. Everything outside of the territories mentioned is the Senegal-Niger colony.

French settlement began as early as 1637, but the colony was taken by the English in 1756 and, except in 1779, held till 1815, when it passed permanently into the hands of France. Progress began in 1854, and prosperity has grown ever since. The colony is self-supporting. The chief towns have schools with over 2,000 pupils. The natives cultivate maize, millet and rice. Other products include castor-beans, cocoanuts, ground-nuts, gums, kola and rubber. The domestic animals are camels, cattle, goats and sheep. Copper, gold, mercury and silver are found. The industries comprise brickmaking, jewelry, pottery and weaving. The imports in 1909 were valued at 67,912,239 francs, the exports at 59,164,917 francs. There are nearly 600 miles of railway 1,241 of telegraph and about 200 of telephone. A submarine cable has connected Dakar with Brest, France, since April of 1905. Dakar also has regular steamship-service to French ports. Hamburg and Liverpool. The chief railroad is the line along the coast that connects Dakar, Rufisque and St. Louis. Another runs from Kayes, the head of flood-navigation on Senegal River (490 miles from St. Louis), to the Niger, so that one can go from Paris to Timbuktu by train and steamer. At Dakar extensive improvements, including a dry-dock, are under way.

Sénégal (*sĕn'ĕ-gal'*), a river of West Africa, has two sources, the Bafing and the Bakhoy.

These streams meet at Bafulabé, 700 miles from the coast, the united Senegal reaching the Atlantic ten miles befow St. Louis. From July to October the river is navigable to within 40 miles of Bafulabé, but the channel has many falls, narrows and low, flat islands. The mouth is being dredged and deepened. A railroad has been built along the left bank for 82 miles from Kayes to Bafulabé, which has been carried to Bamaku on the Niger.

Senegambia-Niger (*sĕn'ĕ-găm'bĭ-ā-nī'jĕr*) since 1902 consists of territories under the administration of the governor-general of French West Africa, and includes some of the older Senegal protectorates, the remnants of the former French Sudan and the Military Territory. (The name "Senegambia" is not used by the French.) It is divided into two parts, one including the old Senegal protectorates as far as Falémé River. The other is bounded on the north by the Algerian sphere, on the west by Falémé River and French Guinea, on the south by the Ivory Coast, Gold Coast, Togoland, Dahomé to the Niger and its left bank to Northern Nigeria, and on the east by the Military Territory from Lake Chad. It therefore includes the valley of the upper Senegal, two thirds of the entire course of the Niger, taking in the great bend and the countries enclosed, and Sahara north to the Algerian sphere of influence. The area is 370,000 square miles, the population 8,000,000. It is all under civil administration, with its budget balancing in 1907 at 6,963,500 francs, and has a regular judicial and educational system, a complete system of telegraph lines, good roads between all important centers and the Senegal-Niger railway completed from Kayes through Bamaku to Kulikoro, 349 miles. In 1905 the expenditure for railway construction amounted to 688,000 francs.

Senn, Nicholas, an eminent surgeon, was born in Switzerland in 1844, and brought to the United States in 1853. He was educated in the public schools of Wisconsin, and graduated from Chicago Medical College in 1868 and from the University of Munich in 1878. He practiced his profession in Milwaukee and Chicago, where he was connected with the best medical schools and societies and gained a wide reputation. He was delegate to the International Medical Congress at Berlin in 1890, Moscow in 1897 and Madrid in 1903. He was the author of many works on medical and allied subjects — among them *Medico-Surgical Aspects of the Spanish-American War* and *Our National Recreation Parks.* His death occurred in Chicago in 1908.

Sennacherib (*sĕn-năk'ĕ-rĭb*), an Assyrian king, son of Sargon, reigned from 705 to 681 B. C. He built the embankment of the Tigris, made canals and water-courses, built a huge palace at Nineveh, and was the founder of many other public works. See ASSYRIA.

Sen'sitive Plants. All plants are more or less sensitive, that is, able to respond to stimuli. Some plants, however, respond so quickly and so evidently that they have been popularly called sensitive plants. Conspicuous among them are species of mimosa, acacia and their allies, members of the pea family. These particular plants have large, compound leaves composed of numerous and very small leaflets. At a sudden touch the paired leaflets fold together, or the whole leaf may fold up and its petiole droop. In the natural surroundings of these plants this folding of the leaves has to do with the avoidance of too intense light or drought, the surface of exposure thus being diminished in exact proportion to the need.

Seoul (*se-o͞ol'*), capital of Korea (*q.v.*), is on the Han, 75 miles from its entrance into the Yellow Sea. It is in a basin in the midst of granite hills and is surrounded by a wall. Narrow, dirty streets; wide, open squares; poorly built houses; and a royal palace covering 600 acres make the city. Silk, paper, tobacco, mats and fans are produced. Population 196,646.

Se'pal (in plants), one of the parts which together make up the calyx or outer set of floral leaves. See FLOWER.

(*s, s*) SEPALS

Separator, Cream. See CREAM-SEPARATOR.

Se'poy, a native Hindu soldier, as distinguished from a *gora* or white soldier. Sepoys have always been volunteers. The French first employed them in the 18th century. The East India Company had 10,000 Sepoys at the time of the battle of Plassy. This force had grown to 45,000 by the time the first governor-general was appointed (1773). Their discipline, faithfulness and good services caused general belief in their loyalty until the outbreak of the Sepoy rebellion in 1857. The army was then 300,000 strong, all Sepoys but 40,000. The rising took place among the high-caste Hindus, who made up the Bengal army. The Sepoy forces of Madras, Bombay and the Punjab took no part in it. This rebellion cost the British $200,000,000. Since 1857 the proportion of Sepoys to Europeans is less, it being now two to one instead of six to one.

Septem'ber, from the Latin word meaning seven, was the seventh month of the Roman calendar, but is the ninth according to our reckoning. The Anglo-Saxons called it *gerst-monath* or barley-month.

Sequoia (*sē-kwoi'ā*), a genus of the Conifers, whose two species are native only in California. They are the famous redwoods or Big Trees and form one of the attractions to visitors in California. The species

are *S. sempervirens*, the true redwood, and *S. gigantea*, the giant redwood. The former grows only in the Coast Ranges, and is abundant enough to be a very important lumber tree. The recorded sizes are from 50 to 75 feet in circumference and 200 to 300 feet in height. It is one of the most important timber-trees in the world. The Pacific coast is supplied by the redwood with much of its building and fencing lumber. The tree does not thrive away from the sea-fog, all redwood forests being in a strip 20 to 25 miles wide and in length 500 miles. It has marvelous reproductive powers; persistently throws up shoots when cut or fallen, resists fire well, and quickly makes new forests. The giant redwood occurs in groves in a narrow strip along the western slope of the Sierra Nevada. Among the most famous groves are those of Calaveras County and the Mariposa grove just south of the Yosemite. The latter contains one of the largest standing trees, known as the Grizzly Giant, whose trunk at the ground is more than 93 feet in circumference. The age of the largest trees is from 2,000 to 2,500 years. In former ages sequoias were widely distributed throughout the world. As the last survivors of a very ancient and wonderful family, as well as for their own majesty, they are of the greatest interest and value. Nevertheless, many of the giant redwoods of private ownership have been sacrificed for money. A generous gift of a public-spirited citizen, William Kent of Chicago, has provided for the preservation, some few miles out from San Francisco, of a tract heavily wooded with virgin timber, chiefly redwood and Douglas fir. Mr. Kent purchased the forest with the purpose of having it established as a government reserve, and in January of 1908 the government accepted the generous offer; and Muir Woods, the name given to the beautiful cañon forest by the donor, now belong to the nation. See FOREST-RESERVES and MUIR, JOHN.

Sera'pis, the Greek name of an Egyptian god, introduced into Egypt in the time of Ptolemy Soter. He was a combination of the Greek Hades and the Egyptian Osiris. It is said that 42 temples were built for the worship of this god, though they were admitted only into the Greek cities founded in Egypt. The best known of these temples was the magnificent Serapeum at Alexandria, to which was joined the celebrated Alexandrine Library. Antoninus Pius introduced the worship of Serapis into Rome, but it was soon abolished. Many Roman coins have his image joined to that of Isis. The worship of Serapis ceased in Egypt only when his image in Alexandria was destroyed by its Christian archbishop in 398 A. D.

Serf. See SLAVERY.

Ser'pentine, a mineral made up of silica, magnesia and water, with a little protoxide of iron. Serpentine is usually found in masses, never in crystals; is generally some shade of green, but sometimes is red or brownish-yellow; and feels smooth, but often greasy. Precious or noble serpentine is a rich, dark green, hard enough to take a good polish, translucent and sometimes having garnets imbedded, which form red spots and add to its beauty. It is a rather rare mineral, and is found at Baireuth (Germany), in Corsica and in the Shetland Islands. The Romans made of it beautiful pillars; and boxes, vases etc. are still cut from it. Marmolite is a scaly serpentine; chrysolite is a kind with delicate fibers and a silky luster. Common serpentine is a rock rather than a mineral. Its name comes from its being often marked with winding veins. Its color usually is green or red, often mottled, veined or clouded.

Ser'pents. See SNAKES.

Serpent-Wor'ship is one of the oldest forms of religion, and still exists among many savage peoples. Serpent-worship is prominent in Hinduism. We see traces of it in the great serpent which defended the citadel of Athens, fed every month with honey-cakes. Among Zulus harmless green or brown snakes which come boldly into the houses are thought to be ancestors, and are often identified by some scar or mark, such as the man bore in life. Serpents are often looked upon as the embodiment of gods, as was the rattlesnake worshiped in the Natchez temple of the Sun; the Phœnician serpent with its tail in its mouth, an emblem of eternity. Reverence for the serpent is notable among the American Indians, where its name has been given to rivers, as the Kennebec and the Antietam. Among the Dakotas, Shawnees and Sacs the words for spirit and snake are similar. The Algonquins think the lightning a huge snake, and the Caribs speak of the god of the thunder-storm as a mighty serpent. The Ojibways dread to kill a rattlesnake, and, if they find one in their path, beseech it to go away and spare them and their families. The same worship is found among the Cherokees and other tribes as well as in the strange snake-dances of the Zuñis. See Fergusson's *Tree and Serpent Worship*.

Se'rum. The blood in the bloodvessels consists of two parts: the solid, which includes both kinds of corpuscles, and the liquid, called the plasma. When blood escapes from the bloodvessels, it first becomes viscid or like a jelly. If this jelly-like mass is left standing some time, it separates into two parts, a liquid, which is the serum, and a solid clot which floats upon the serum. Now, the clot is found to contain practically all the corpuscles and also a network of fine threads called fibrin. Hence, as the cor-

puscles were there before, we must conclude that the plasma, which is liquid in the body, has now separated into two parts,—fibrin and serum. Serum, as a separate substance, therefore, is never found in the body; and its functions are included in those of the plasma. But in modern medicine a distinct branch of therapeutics or the science of healing takes advantage of the fact that healthy serum possesses power to fight with and destroy certain dangerous bacteria. In vaccination for smallpox the poison of the disease is itself introduced directly into the body, and the blood in the body develops power to destroy this small amount of poison. In so doing it retains power to fight a later infection of the disease itself, because the *antitoxin* or *poison-fighting* substance thus developed in the body remains there for some time. Now, if we infect, for example, a horse with a disease, as pneumonia, the animal's blood develops this power to fight the disease; and if we slowly increase the infection the blood slowly acquires a very great *antitoxin* power. If we then remove some of the blood and secure the serum as above, the antitoxin power is in the serum. Antitoxin serum has been of more use in diphtheria than in any other disease. Children suffering from diphtheria die in 35 to 40% of cases; but where the antitoxin serum for diphtheria is injected while they are suffering from the disease, they die only in 9 to 13% of the cases. Tetanus (lockjaw) was fatal in practically 100% of cases; but antitetanic serum has reduced the mortality to about 35%. The method is of no use, it seems, in some diseases, as cancer, and of little if any service in others, as tuberculosis.

Servia (*sĕr'vĭ-ȧ*), a kingdom of the Balkan peninsula. Soon after the European War began the spelling was changed from "Servia" to "Serbia"—the form used by all except the English speaking peoples. The Serbians objected to the "v" because it suggested the Latin word for slave, "servus."

Most of the farmers use clumsy wooden carts drawn by oxen or—in southern Serbia—buffaloes. The Serbians, well-built and stalwart, and, like all mountaineers, fierce fighters in war, are kind and hospitable in peace and the first farmer you meet will offer you a seat in his cart and is glad to share with you the shelter and the simple table fare of his home which includes corn cakes three times a day. The mother of the household will bring out her delicious plum marmalade which the Serbians make and export; for plum orchards are to the Serbians what apple orchards are to us. Although they grow wheat they raise mostly Indian corn because they want it for their pigs, their cattle and their corn cakes.

In the more primitive regions the "zadruga," an ancient institution reaching clear back to prehistoric times, still survives. These zadrugas are community groups of families related to one another. They live in separate cottages but have a large building in common in which they eat and spend the evenings amusing themselves—the men talking politics (of which they never tire), the women spinning, the children playing or all of them singing or listening to songs about the heroes of the nation contained in their legends and ballads of medieval wars.

Over these groups is a housefather or "staryeschina" and housemother or "domanyitsa" who assigns the household work. Zadrugas were very prosperous and never had any trouble in getting their sowing and reaping done as there were so many hands to work as well as mouths to be filled with corn cakes, pig's meat and marmalade and they combined to buy whatever their little group needed.

In recent years a co-operative system established by King Alexander, modelled after the German system, has largely taken the place of the zadrugas, and the little farms of today do not exceed twenty acres. A Serbian farmer cannot lose all his possessions under a mortgage as an American farmer can because the law will not allow him to give, or another to take, a mortgage covering more than a certain proportion of his land and his cottage he cannot mortgage at all—nor his garden, his plow or the cattle necessary to draw the plow or haul his products to market.

Although, as you may imagine, there are no very rich people neither are there any very poor ones. There are practically no paupers and there are no poorhouses. The people are not so thrifty nor so industrious as the Bulgars nor so clever as the Roumanians, and comparatively few are interested in export statistics or the growth of manufactures. In fact, the Serbian feels that he forfeits his independence by working in a factory. There are meat packing plants, flour mills, breweries, iron foundries, potteries, sugar, tobacco and celluloid factories and mills for weaving hemp, flax and wool but the workers are mainly Austro-Hungarians or Gypsies. There are a few home industries including the making of corded sandals such as peasants wear; handwoven carpets and rugs. They also export native wines, mainly to France and Switzerland. A serious drawback to the commercial development of Serbia has been the lack of seaports, which places the country at the mercy of hostile tariffs; so you can understand why so many wars have been fought all over Europe to get control of seaports.

Serbia is a mountainous country covered with fine forests, from which you can see why it is, in proportion to population, that Serbia has more sheep and hogs than any country in Europe. The sheep are pastured on the slopes and the pigs fattened on the beech nuts and acorns that cover the forest floors. Up to the European War they exported—mainly to Austria because of the seaport situation—cattle, sheep, hogs, hides, wool, timber, copper and that lucious plum marmalade, and imported manufactured articles, chiefly from Austria, Germany and Great Britain.

Simple in their tastes, a moderate amount of work enables the Serbian to live as well as he cares to and to spend his evenings talking politics, dancing or singing. These songs—these legends—keep alive the dream of a reunion of the race in a Serbian Empire like that

overthrown when they were conquered and subjected by the Turks in 1389. The most momentous event, not only in the history of Serbia but in the history of Europe, was the assassination of the Crown Prince of Austria by Serbian students in Zaregevo, Bosnia, thus precipitating the European War (*q. v.*). (Consult Laneleye's *Balkan Peninsula* on Serbia previous to the war.)

Her first independent monarch was crowned as Milan I in 1882. He gave up the throne to his son Alexander, then 13 years old, in 1889. On June 11, 1903, King Alexander and Queen Draga were assassinated as the result of a conspiracy in the palace and Peter Karageorgevitch as Peter I succeeded him. Their religion is the Greek-Orthodox. The monarchy is constitutional and hereditary.

Sesostris (*sĕ-sŏs'trĭs*), the Greek name of a celebrated Egyptian king. According to the Greek accounts, Sesostris at the head of a large army invaded Libya, Arabia, Asia, Europe, Thrace and Scythia, leaving a colony at Colchis on his way home. In the south he conquered Ethiopia, and by means of his fleet on the Red Sea got possession of the neighboring islands and widened his dominions to India itself. Captives in great numbers were put to work on temples, canals and mounds. Sesostris is said to have gone blind after a reign of 33 years, and to have taken his own life. Just who this great conqueror was is a puzzle. The most reasonable explanation is that his doings are the confused exploits of Sethos I and Rameses II.

Se'ton, Ernest Thompson, lecturer, illustrator and author, was born in South Shields, England, in 1860; but spent his boyhood and youth (from 1866) in Canada and on the western plains. He was educated in Toronto, Canada, and London, England. In 1891 he became naturalist to the government of Manitoba; and wrote not only serious works upon the *Birds of Manitoba* and the *Mammals of Manitoba*, but clever and attractive tales for magazines, which purported to be based on actual observation of the ways of animal life. Mr. Seton contributed a number of illustrations to *The Century Dictionary*. He is the author and illustrator of *Art Anatomy of Animals; Wild Animals I have Known; The Trail of the Sandhill Stag; The Biography of a Grizzly; Lobo, Rag and Vixen; Lives of the Hunted; Pictures of Wild Animals; Two Little Savages; and Krag and Johnny Bear.*

Set'ter, a breed of dog employed in shooting birds. There are three varieties — the English, the Gordon and the Irish setter. Dogs had been trained from the 16th century to scent game, but it was not until the beginning of the 19th century that a record of a distinct breed of setter was begun. The English setter generally is white with red markings or with black spots. The Gordon setter was bred by the duke of Gordon in 1800, by crossing the existing setter with the collie. This setter should be a rich and glossy black, marked with tan on the face, chest and legs. The origin of the Irish setter with its deep chestnut-red color is unknown. See Dog.

Sev'en Sleep'ers, the heroes of a celebrated tale. During the flight of the Christians from the persecution under Decius seven Christians of Ephesus took refuge in a cave near the city, where they were discovered by their pursuers, who walled the entrance to starve them to death. Instead they fell into a sleep which lasted from 250 or 251 to the reign of Theodosius (447). They imagined that their sleep had been but for a night. One of the seven went secretly into the city to buy food, and was thunderstuck to see the cross on churches and other buildings. Offering a coin of Decius at a bakery he was arrested, his startling story not being believed till he guided the citizens to the cave where he had left his comrades. The emperor heard enough from their lips to make him believe in the life beyond the grave, whereupon they sank again to sleep till the resurrection. The Roman church holds their festival on June 27. The story was adopted by Mohammed. A like story is told in Germany. See Rydberg's *Teutonic Mythology*.

Seven Wise Men, Greek sages, whose lives were embodied in certain maxims. Their names and characteristic sayings are as follows: Solon of Athens — "Nothing in excess"; Thales of Miletus — "Suretyship brings ruin"; Pittacus of Mitylene — "Know thine opportunity"; Bias of Priene in Ionia — "Too many workers spoil the work"; Chilon of Sparta — "Know thyself"; Cleobulus, tyrant of Lindus in Rhodes — "Moderation is the chief good"; and Periander, tyrant of Corinth — "Forethought in all things."

Seven Won'ders of the World were in early times reckoned to be the Pyramids of Egypt, the Hanging (that is, terraced) Gardens of Semiramis at Babylon, the Temple of Diana at Ephesus the Statue of Jupiter at Athens by Pheidias, the Mausoleum, the Colossus at Rhodes and the Pharos (or lighthouse) at Alexandria.

Seven Years' War (1756-63). A struggle in Europe, which had far-reaching results, between Prussia under Frederick the Great and a confederacy of European powers, consisting mainly of Austria under Empress Maria Theresa, Russia, Saxony, Sweden and France. The immediate object of the war was to enable Austria to regain possession of Silesia, duchies which had in 1740 been seized by Frederick, and this precipitated a strife known as the Seven Years' War or the third Silesian War. With Prussia was allied England under George II, who sought thus to secure his Hanoverian possessions against France, and between which and the English there had been a growing ill-feeling in consequence

of rivalry in the American colonies and in India. On the part of the confederacy of Austria, Russia and France the feeling that led to the war was European jealousy of the growing power of Prussia, whose prestige had been greatly raised by the genius of Frederick. On the outbreak of the war he made himself master of Saxony by the defeat of the Austrians at Lobositz (October, 1756), temporarily invaded Bohemia, and gain inflicted defeat upon the Austrians (at Prague, May, 1757), followed by victories later in the year over the French and Austrians at Rossbach and over the Austrians alone at Leuthen (December, 1757). Through varying fortune Frederick's military genius enabled him in the two ensuing years to wrest victories from the Russians at Zorndorf and from the French at Minden, though his capital was taken by the Russians and was subjected to three days' plunder. In 1761 the English, owing to the death of George II, withdrew their subsidies to Prussia; but Frederick's straits were somewhat relieved in the following year, when Elizabeth of Russia died and Peter III, her successor, in his few months' reign made peace with Prussia. Sweden and France fell away from the alliance, and at Hubertusburg, Austria, too weak to carry on the war alone, made peace with Prussia, Feb. 15, 1763, and Silesia was confirmed as a possession of Frederick.

Aside from European complications, there was at this time, between England and France, cause enough for war in the friction between the two nations, owing to their rivalries in India and in North America and to the desire of both to settle who should be master of these vast domains. France had colonized Canada and Louisiana, while England had established colonies along that part of the Atlantic coast which separated the French settlements. To connect the latter and to exclude England from the great fur-trade of the interior, France erected military posts from Niagara River to the mouth of the Mississippi. This was naturally resented by England and her colonies, and precipitated a conflict in the Ohio Valley and on the St. Lawrence, which had its fateful issue in the conquest of Quebec and the surrender of Canada to Britain. In India English prowess met with like good fortune. The East India Company had founded settlements for trade, which gave promise of extending to an empire; but France, jealous of her hereditary rival, endeavored to snatch the prize. Dupleix, the French governor of Pondicherry, captured Madras, and by intriguing with the native princes attempted to make French power supreme over the country. In this ambitious scheme he was checkmated by Lord Clive, who from a clerkship in the East India Company rose to be one of the greatest of English generals and the savior of India. Clive captured Arcot, and in 1757, when the sovereignty of Bengal was in peril, he won a great victory over the native insurgents at Plassey, which made Bengal a British province, saved the English residents from massacre, and, in spite of the atrocity of the Black Hole at Calcutta, laid the foundations of British rule in India. The war, which raised Prussia to the front rank among European powers and developed England's colonial empire, was marked by naval victories which fell to the English, as the affairs at Louisbourg, Lagos and Quiberon Bay. Consult Carlyle's *Frederick the Great;* lives of *William Pitt*, *General Wolfe* and *Lord Clive;* and Parkman's *Montcalm and Wolfe*. See FRENCH AND INDIAN WAR.

Severn (*sĕv'ĕrn*), the second largest river of England, rises in Wales and after 210 miles falls into Bristol Channel. It is navigable for 180 miles; a canal has helped navigation from Gloucester, and is now being extended to Worcester. Below Gloucester the swiftly flowing tide produces a bore or wave five or six feet high. The Severn is a beautiful as well as an important river.

Severus (*sĕ-vē'rŭs*), **Alexander,** a Roman emperor, was born about 205 A. D. He was the adopted son of Emperor Heliogabalus, who, in his jealousy of the young man's popularity, vainly tried to kill him. Severus became emperor in 222. His first nine years were peaceful, but in 231 he began a war with the Persians, in which he was successful. In 235 he began a campaign against the Germans on the Rhine, in which he lost his life, not at the hands of the enemy, but at those of his own soldiers.

Severus, L. Septimius, a Roman emperor and a vigorous and courageous soldier, was born in Africa in 146 A. D. At the time of the murder of Pertinax (193) he was in command of an army in Pannonia and Illyria. At once proclaimed emperor, he marched on Rome, which was held by Julianus, who had obtained the throne by bribery. Julianus and the murderers of Pertinax were punished, one rival, Clodius Albinus, won by the gift of the title of Cæsar, the soldiers flattered by a rich largess, and a second rival conquered at Issus. A glorious campaign in the east and the three years' siege and capture of Byzantium were followed by a hard struggle with the jealous Clodius, whom he defeated near Lyons in 197. After the usual games to the citizens of Rome and largesses to the troops, he marched on the Parthians and took and plundered their capital. By 202 he was again in Rome, pleasing the people with shows of unheard-of magnificence and showering gold upon citizens and officers. In 208 he marched at the head of a large army to put down a rebellion in Britain, and repaired Hadrian's wall, which is often

called after him. He died at York (*Eboracum*) on Feb. 4. 211.

Sevier (*sē-vēr'*), **John,** American politician and celebrated pioneer and Indian-fighter, was born in Rockingham County, Virginia, in 1745; and died in Georgia in 1815. He married at 17; and at 19 founded a village in Shenandoah Valley. This settlement grew into the town of Newmarket. He was a captain in the Virginia Line during Lord Dunmore's colonial war (1774). It was he who requested the annexation to North Carolina of what is now Tennessee. After the War of the Revolution this region became ambitious for an independent government; and one was actually formed. Sevier became governor of this attempted state, which was called Franklin. North Carolina broke up the government and imprisoned Sevier. He escaped, and in 1790 was returned to Congress. He was made Tennessee's first governor when it was formed into a state (1796). This office he held until 1801; and again from 1803 to 1809. From 1811 he served four years in Congress. Sevier's death took place while he was engaged in negotiations with the Creek Indians.

Sévigné (*sā'vēn'yā'*), **Madame de,** the queen of letter-writers, was born at Paris, as Marie de Rabutin-Chantal, Feb. 6, 1626. At 18 she married a spendthrift marquis, whom she forgave and loved. At the death of her husband in 1651, she was brilliant in beauty and fascination. The prince of Conti, Turenne, Rohan and others courted her in vain. But no woman ever knew, as she did, how to change a lover into a friend, and perhaps no one ever had so many and such friends. But as to love, — that was wholly bound up in her son and daughter. The marriage of the daughter to the Count of Grignan, lieutenant-général of Provence, obliged her to live away from Paris. This separation from her daughter was the grief of Madame de Sévigné's life, but it is mainly to it that we owe those letters, extending over the 25 years till her death. These letters tell the inner history of the time in great detail; but are most valuable as mere letters, charming in their good sense, sparkling wit and inbreathed affection. The writer died on April 18, 1696. Consult Amelia Gere Mason's *Women of the French Salons*. See LETTERS.

Seville (*sā-vēl'yā*), one of the most famous Spanish cities, is on the Guadalquivir, 62 miles northeast of Cadiz. Up to a short time ago Seville had the appearance of a picturesque Moorish town — narrow shaded streets, houses built around handsome courts and gardens and fountain-studded squares. But now room has been made for wide, straight streets and modern houses and shops. The great ornament of the city is its Gothic cathedral, the second largest in the world, containing paintings by Murillo and others, a great organ, the tombs of Ferdinand III of Castile and Ferdinand the son of Columbus and fine bronze, sculptured and wood-carving work. Close beside stands the beautiful tower called Giralda, 275 feet high. Another of the glories of Seville is the Alcazar or Moorish royal palace, whose halls and gardens are surpassed only by those of the Alhambra. The museum and charity hospital contain masterpieces by Murillo. The bull-ring can accommodate 18,000 spectators. The leading manufactures are cigars, iron, machinery and pottery. Seville also is a large port of entry. The largest imports are chemicals and timber; the chief exports, lead, quicksilver, wine, copper, oranges, olives, olive-oil and corks. This city was the Roman *Hispalis*, a place of trade in those days. Under the name of *Ishbilia* from 712 to 1248 it was an important Moorish city. When Ferdinand III of Castile captured it (1248), about 300,000 Moors abandoned the place. Population 155,366. Seville or Sevilla also is a province. Area 5,428 square miles; population 587,186.

Sévres (*sā'vr'*), a small town in France, 2½ miles southwest of Paris, celebrated for its porcelain. Sèvres vases are of great value and are known the world over. Painted glass and mosaic are also made. Porcelain has been manufactured under state control since 1756. Population 8,000. See Garnier's *Soft Porcelain of Sèvres*.

Seward (*sū'ĕrd*), **William Henry,** was born at Florida, N. Y., May 16, 1801. He graduated at Union College in 1820, and became a lawyer. He joined the Whigs, being the party leader in the state senate from 1830 to 1834. Defeated for the governorship in 1834, he was elected in 1838 and 1840. He refused a nomination for a third term, and between 1843 and 1849, when he entered the United States senate, he gained an enviable reputation as a criminal and patent lawyer. While governor he had refused to surrender to the governor of Virginia three negro seamen, demanded on the charge of inciting a slave to escape. He was against the admission of Texas as a slave-holding state, and thus became marked as an opponent of slavery. His speech in defense of Freeman, a negro murderer, Gladstone has called "the greatest forensic effort in

WILLIAM H. SEWARD

the English language." Two terms as senator brought him to the front as an able and patriotic statesman, and when the Republican party was formed he became one of its first leaders. A strong candidate for the presidential nomination in 1860, Seward entered Lincoln's cabinet at its head, filling the office of secretary of state from 1861 to 1869. His moderation in the *Trent* affair, in which he advised giving up the envoys, as demanded by England, probably saved us from a war with Britain. His claim for damages from the English government, because of the *Alabama* being fitted out in British ports, was sustained. His most important service to the country, perhaps, was his purchase of Alaska (*q. v.*) from Russia in 1867. In the spring of 1865 Mr. Seward was thrown from his carriage, breaking his jaw and an arm. While confined to bed, on the night of Lincoln's assassination, April 14, one of the conspirators made his way to the secretary's room and severely cut his face and neck. Seward died at Auburn, N. Y., Oct. 10, 1872. Consult *Life and Letters* by his son.

Sew'erage, a system of underground pipes or conduits for the removal of sewage or the rain-water of a place. Sewerage is required for sanitary reasons in towns and cities. In the country, where population is not dense, sewage can be disposed of without any elaborate system, though care must always be taken that the water-supply is not contaminated. The construction of elaborate sewer-systems is found in ancient cities, as Babylon, Jerusalem and Rome, but it is only within recent years that it has received the attention it deserves in modern cities. There are two systems in use,—the combined and the separate system. In the combined system the same pipes carry both the sewage and the storm-water; in the separate system, called the Waring system, there are separate pipes for the sewage and for the storm-water. In the latter system the flushing is done by automatic flush-tanks supplied with water from the town waterworks. The separate system is recommended by most sanitary engineers. The liquid sewage may flow due to the fall of the pipes, but in many cases pumping has to be resorted to. Among the methods of sewerage disposal are the following: (*a*) by dilution by discharge into a large mass of flowing water which is not used for a water-supply, as at New York City and in towns on the lower Mississippi; (*b*) by running the liquid sewage over a large area of land and letting it oxidize in the air; and (*c*) by chemical treatment to kill the organic life. In some cases, as at Berlin, Germany, the sewage is used to fertilize land which is cultivated. Chicago has constructed a drainage canal at a cost of $53,000,000 to dispose of its sewage by dilution with a large body of water taken from Lake Michigan and emptied into Illinois River.

Sew'ing-Machine', a machine which takes the place of the old-fashioned needle and thread in sewing garments. Several attempts were made in England and the United States to invent a machine for sewing, but without much success until Elias Howe of Cambridge, Mass., patented his first machine in 1846. This machine uses the lock-stitch, which is used by most machines now, and from 1854 until the patents expired Howe received a royalty on every machine made, amounting to over $2,000,000. The lock-stitch makes use of two threads, one in the needle which pushes the thread down through the cloth, forming a loop; the other thread is wound on a bobbin and placed in a shuttle which carries the second thread through the loop made by the first one. The rotating hook is used instead of a shuttle in some machines. The loop-stitch is made by a curved needle, which catches the loop made by the upper needle and passes the thread through it. The most important improvement on Howe's original machine was made by Allan B. Wilson in his "four-motioned feed," which carries the work along and has been adopted in all machines. There are a large variety of machines, differing slightly, and also those made for different purposes. The family sewing-machine has revolutionized the work of the home; the button-hole machine cuts the hole, works it around, bars the ends, stops of itself when it is done, and makes 6,000 buttonholes in a day. The carpet-sewing machine, the cylinder machine for stitching mailbags, satchels, shoes, water-hose and all kinds of leather work; the universal arm-feeder machine for making gloves; the basting and quilting machine; and the pattern-stitching machine are a few of the varieties in use. The largest sewing-machine manufacturing company is the Singer, which has factories in Scotland, Austria, Canada and the United States. Since 1878, when the principal patents expired, the price of sewing-machines has been much reduced.

Sex'tant. See QUAD'RANT.

Sex'ual Spore (in plants), a spore which has been produced by the union of two gametes, that is, by fertilization. The general name of such a spore is oöspore or fertilized egg. The name is unfortunate, since the spore is not sexual, the full phrase merely meaning a sexually formed spore. See SPORE.

Seychelles (*sā'shĕl'*) **Archipelago,** 89 islands and islets belonging to Great Britain, in the Indian Ocean, off Zanzibar on the eastern coast of Africa and north of Mauritius. Their total estimated area, with dependencies, is about 150 square miles, with a population estimated at 20,767. Formerly administered from Mauritius, the

islands are under an executive council, with an administrator who has the rank of Governor. The capital is Victoria on Mahé Island, which has a good harbor and has lately been made a coaling-station. Communication with the islands is had by the steamers of the Messageries Maritimes, which ply once a month (carrying the mails) between Marseilles and Mauritius, and occasionally by the steamers of the British India Steam Navigation Company. The islands have had telegraphic communication with Mauritius and with Europe since 1893. There are good schools on the islands, with good roads on the chief islands, as Mahé, Praslin and La Digue. The imports from the Seychelles into Great Britain (chiefly of drugs) amount in value to about $150,000: the exports consist of vanilla, cocoanut-oil, soap, guano, salt-fish, tortoise-shell, coffee and cocoa. Consult Salmon's *Crown-Colonies of Great Britain* and Belcher's *Account of the Seychelles.*

Sey'mour, Hora'tio, was born at Pompey, N. Y., May 31, 1810. He studied at a military school and became a lawyer. In 1841 he entered the New York assembly as a Democrat, and was three times re-elected, in 1845 being chosen speaker. Defeated for governor in 1850, he was elected by a large majority two years later. Seymour came into great prominence as one of New York's war-governors, holding this office during the draft-riots in New York City. He presided over the Democratic national convention of 1868, which was held in New York City. He had refused to be a candidate, but on the 22d ballot was nominated for the presidency by a sudden wave of enthusiasm, in spite of his loudly spoken protestations. He, however, received but 80 electoral votes. He died at Utica, N. Y., Feb. 12, 1886.

Sforza (*sfôr'tsȧ*), **Frances'co,** when 23 succeeded his father, Muzio Attendolo, the founder of the family, who was called Sforza, meaning "stormer" (of cities), in command of a famous band of *condottiere*, soldiers who sold their swords to the highest bidder. He fought at times for and against the pope, Milan, Venice, and Florence. He invented a better system of tactics than had been in use, and it soon came to be taken for granted that victory was certain for the party which had his support. So it came about naturally that the peasant chief won the hand of Bianca, the only child of the duke of Milan. Meanwhile Sforza wrested Ancona and Pesaro from the pope. At the death of his father-in-law in 1450, he gained the dukedom by a combination of stratagem and force. He made firm his authority over all Lombardy and several districts south of the Po, gained the favor of Louis XI, who gave him Savona and Genoa, and won the love of all his subjects. Though himself ignorant, he loved and protected letters. Sforza died on March 8, 1466, and was followed by five dukes of his family.

Shad, an important food-fish belonging to the herring family. The American shad is more valued than the European species. It ranges along the Atlantic coast from New England to the Gulf of Mexico, and ascends different rivers to spawn. This species has been successfully introduced on the Pacific coast. The full-grown fish is about 30 inches long. Its color is bluish, with silvery sides and usually a dark blotch behind the gill-covers and, often, several in a row behind this. These fish were among the first to be protected and artificially propagated by the United States Fish Commission. The result of this care was to increase their numbers greatly. Statistics show that the catch of shad in 1890 was two and one half times that of 1880.

Shad'dock, a native tree of the East Indies, which has been long grown in southern Europe. Its name is said to come from Captain Shaddock, who introduced it into the West Indies in 1810. It has large, white flowers, and its fruit also is very large, sometimes weighing from 10 to 14 pounds, roundish and pale yellow. The pulp is green and watery, and has a slight acid taste. Finer and smaller than the shaddock proper is the pomelo (also called pummelo, pompelmoose and grapefruit), a variety rather larger than an orange, which bears its fruit in clusters. Both kinds are grown in Florida and sold in the north.

Shad'ow, in optics the region immediately behind an opaque object which cannot be illuminated by a source of light in front of the opaque object. If the source of light is a single point, we find that the shadow is geometrically similar to the outline of the opaque object, which is a consequence of the fact that light moves in straight lines in a homogenous medium. Such a shadow is exhibited in Fig. 1. In case the luminous source is not a single point, but an extended body, we find that the shadow consists of two parts, one a

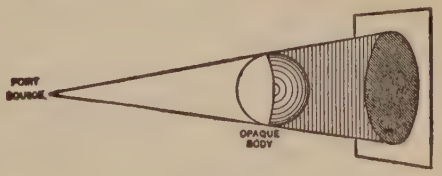


FIG. 1

central, dark area, called the *umbra*, the other a partly illuminated border, called the *penumbra*. This is well-illustrated in the case of the sun and earth shown in Fig. 2. The penumbra, as will be evident from the figure, is merely that region which is illuminated by some but not all points on the luminous source. The more nearly

a source approximates a point, the more nearly does the penumbra vanish. This almost complete absence of penumbra is well-shown in the shadows cast by naked electric arcs. In case a shadow is produced

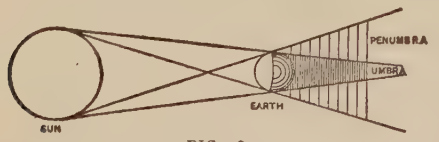


FIG. 2

by a point-source it is always accompanied by a series of diffraction-fringes, called, after their discoverer, Grimaldi's fringes. These are beautifully shown in the case of the naked arc-light, where the first three fringes of the series are easily seen bordering the shadow of each twig on a tree or the shadow of one's lead-pencil cast on a sheet of white paper. For explanation of these fringes see Preston's *Theory of Light.*

Shaf'ter, William Rufus, American general, was born at Galesburg, Mich., Oct. 16 1835. In 1861 he entered the Union army as lieutenant in the 7th regiment of Michigan volunteers, and distinguished himself in the campaigns under McClellan in Virginia. He rose to be lieutenant-colonel and subsequently was brevetted brigadier-general for gallantry in action. When the volunteer army was disbanded at the close of the Civil War, he entered the regular army as lieutenant-colonel of the 41st United States infantry. After this he rose to be colonel, and then brigadier-general in 1897 On the outbreak of the war with Spain (*q. v.*) he was put in command of an expedition to Cuba (*q. v.*) with the rank of major-general of volunteers. In May 1898, he proceeded to Tampa, Fla., then to Cuba, where, in June and July, he commanded the military operations which ended in the capitulation of Santiago (*q. v.*) de Cuba and the surrender of General Linares' army of over 20,000 men. He subsequently was in command of the department of California and the Columbia, and was retired on June 30, 1901. He died on Nov. 12, 1906. See SPANISH-AMERICAN WAR.

Shag. See COR'MORANT.

Shagreen', a name given to the skins of sharks, rays and other fish of the same family. These skins have a covering of small, hard grains, which stand wear better than ordinary leather. Such skins, when prepared like parchment and dyed and smoothed, have an attractive look, and are used for covering small caskets, cigar-cases, spectacle-cases and small boxes. The name "shagreen," a Persian word meaning the back of a beast of burden, is also, and perhaps was first, given to skins of horses, asses and other animals, prepared by unhairing and scraping them. Each piece is then stretched on a frame; and, while still moist, the seeds of a kind of chenopodium are sprinkled on the surface and forced in by the feet or a press. When the skin is dry, the seeds are beaten out, leaving a pitted appearance. It is then pared down and placed in water, till the pits swell and give the skin a pimpled look, like that of the shark. The covers of old Persian manuscripts are made of this shagreen, which is also used in the east for horse-trappings and shoes. Wood is embossed sometimes in a like way.

Shah, the title applied by Europeans to the ruler of Persia. It is a general name for king, widely used in southern and central Asia. The full Persian form is *Padishah.*

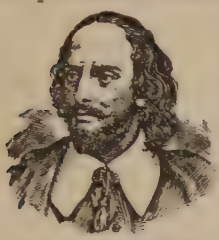
Shah-Jehan', the fifth of the Mogul emperors of Delhi. For the last four years of the reign of his father, Emperor Jahangir, he was in open rebellion. Greeted as emperor by the nobles on Jahangir's death in 1627, he began a warlike and successful reign, conquering the Deccan kings of Ahmadnagur, Bijapur and Golconda. He was an able and just ruler, and a good business-manager as well. The magnificence of his court was unequaled. The splendid peacock-throne was built by his orders at a cost of nearly $35,000,000. Of other great public buildings which remain as a monument of his greatness are the grand *Taj-Mahal* (*q. v.*) and the matchless pearl-mosque at Agra and the palace and great mosque at Delhi. He was deposed in 1658 by Aurungzeb, his son, and died in 1666.

Shah'jahan'pur, a city of British India, in the northwestern provinces, is 100 miles northwest of Lucknow. It takes its name from Shah-Jehan, in whose reign it was founded in 1647. It was a hotbed of rebellion during the mutiny of 1857-8. Sugar is made and exported here. Population 76,458.

Shak'ers, a religious sect. They arose in England about the middle of the 18th century, under the leadership of James Wardlaw and his wife. They were Quakers, but professed to have had a revelation that the second coming of Christ was at hand and that he would appear in the form of a woman. Ann Lee was one of their first converts, and her preaching drew such crowds that she and the Wardlaws were imprisoned. While in prison she professed to have received another revelation, which made her accepted as the female Christ whose reign had been promised. She was called Mother Lee, and is considered the head of the Shakers. The new kingdom, by revelation they learned, was to be set up in America, and the first settlement was made in Albany County, New York, five miles from Albany. Their special doctrines are holding property in common; celibacy or refraining from marriage; and the duty of labor. They live in families of brothers and sisters, presided over by elders and elderesses

and deacons and deaconesses. They are very neat and industrious, and are known for their flower-seeds and herbs which they raise for market. They make use of singing and dancing in their worship, which has given them their name, their own title being the United Society of Believers in Christ's Second Appearing. They have 15 settlements in the United States, several of them called Lebanon, from New Lebanon, N. Y., which was the second established in the country. Their property is valued at $10,000,000, and they number 1,000 members. See LEE, ANN, and Evans's *The Shakers*.

Shake'speare, William, the world's greatest poet and dramatist, was born at Stratford-on-Avon, England, near the end of April, 1564, the oldest son and third child of John Shakespeare. He probably went to free school at Stratford. In 1578 his father, who could not sign his own name but had risen to be high bailiff of Stratford, began to lose money. It is thought that soon after this William was taken out of school, and either apprenticed to a butcher or else worked as a lawyer's clerk. In 1582 Shakespeare married Anne Hathaway. He had three children: a daughter, Susanna, and twins — a boy, Hammet, who died when 12, and a girl, Judith. Both daughters outlived their father. A story has come to us, whether true or not is not known, that Shakespeare's first attempt at poetry was a ballad at the expense of Sir Thomas Lucy, whose deer-park the poet with some companions had robbed. The angry squire had prosecuted him, hence the satirical ballad. This unfortunate piece of poetry only made matters worse, and is said to have caused him to run off to London. Here, according to one account, he was employed holding at the playhouse-door the horses of those theater-goers who came without their servants. However, we know nothing certain of this part of his life. But in 1592 we find a reference to him in Henry Chettle's pamphlet, *Kind-Harts Dream*, which appeared in that year. Chettle speaks of him as "exelent in the qualitie he professes"— that is, acting — and praises his "uprightness of deeling" and "his facetious grace in writing." In spite, though, of Chettle's approval, it is certain that Shakespeare was not great as an actor. He did, indeed, have the pleasure of playing several times before Queen Elizabeth, whom he compliments in *Midsummer Night's Dream*. However, the great poet was not himself a mere dreamer. He soon became a theatrical shareholder, by 1597 was able to buy a home at Stratford, and in 1602 purchased a place of 107 acres near by.



WILLIAM SHAKESPEARE

Probably in 1589-90 Shakespeare began his career as a playwright. Among his earliest comedies were *Love's Labour's Lost*, *The Comedy of Errors* and *The Two Gentlemen of Verona;* among his earliest historical dramas were the second and third parts of *Henry VI*, *King Richard III* and *King Richard II;* the first romantic tragedy was *Romeo and Juliet*. The other two early plays of *Titus Andronicus* and the *First Part of Henry VI*, were, it is thought, partly the work of other hands. This greatest of series of plays thus begun was ended by *King Henry VIII* (1612-13), which critics think was written in part by Fletcher.

While writing, Shakespeare still continued to act; he is known to have played a part in Jonson's *Sejanus* in 1603 or 1604, but it is not known when he left the stage. Shakespeare died at Stratford-on-Avon, April 23, 1616, which is supposed to have been the anniversary of his birthday. See Morley's *English Literature;* Brandes's *Wm. Shakespeare;* Moulton's and R. G. White's *Studies;* and Sidney Lee's *Life*.

Shale, a variety of sedimentary rock formed from beds of mud or clay. The mud or clay was originally deposited in lakes or in the sea. Compacted by its own weight or by the weight of sediments laid down above it, and cemented by mineral matter deposited from solution by the waters percolating through it, the mud or clay becomes shale. Shales are of various degrees of hardness according to the degree of cementation, compression etc. Some shale breaks into slabs appropriate for the construction of walks. Such shale is *flagstone*. Shale occurs in rock-systems of all ages later than Archean (See GEOLOGY.) Soft shale is often ground into clay for the manufacture of brick, tiles etc. When subjected to compression great enough to render it partially metamorphic, shale is converted into slate. If the metamorphism go still further, shale may be converted into crystalline schist, as mica-schist.

Sha'ler, Nathaniel Southgate, American geologist and paleontologist, was born at Newport, Ky., Feb. 22, 1841, and graduated at Lawrence Scientific School, Harvard, of which he was dean and professor of geology. After 1884 he also was geologist in charge of the Atlantic division of the United States geological survey and member of the National Academy of Sciences. For seven years (1873-80) he had charge of the geological survey of Kentucky, devoting part of each year to that work, and publishing many volumes as the result of his labors. His writings embrace *Nature and Man in North America; Aspects of the Earth; The Story of Our Continent; Sea and Land; A First Book in Geology; The Interpretation*

of Nature; Features of Coasts and Oceans; and *Kentucky*. His death occurred on April 10, 1906.

Shamo'kin, Pa., a borough of Northumberland County, eastern central Pennsylvania, 20 miles south of Danville, Montour County, and 18 southeast of Sunbury, the county-seat. It is on the Northern Central and Reading railroads, in the center of the great anthracite region. It contains manufactories, machine-shops, foundries, flour and planing mills and other industries. The town has good schools, several churches, a public library and all improvements of a progressive place. Population 19,588.

Sham'rock, a ternate-leaved plant, adopted by the Irish as their national emblem. There have been many warm disputes to determine the veritable shamrock. Some writers contend for the woodsorrel, the leaves of which unfold about St. Patrick's Day, while others claim that the white clover is the favored plant. Legends make out that St. Patrick (*q. v.*), when preaching the Gospel to the benighted inhabitants of Ireland, illustrated the great doctrines of the trinity by the triple leaf of the shamrock. The leaf of the white clover is the one now generally worn by Irishmen on St. Patrick's Day.

Shanghai (*shăng-hā'ĭ*), a city in central China, in the province of Kiangsu and its most important seaport, is 12 miles from the mouth of the Yangtse-Kiang. The Chinese part of the city has narrow, dirty streets, and is surrounded by a wall, with crowded suburbs. The French and English portions on the north, parallel with the river, are well-lighted and paved, with handsome houses and fine public buildings. The city is strongly fortified. Shanghai was opened to foreign commerce in 1842, and has a large trade with Great Britain, Hong-Kong, India and the United States in silk, tea, cotton, rice, sugar, paper, hemp, wheat, oils, flower and fruit-seeds, fans and medicines. About 2,900 vessels enter the port annually. Population 651,000.

Shan'ly, Charles Dawson, poet, humorist and engineer, was born in Dublin, Ireland, March 9, 1811, and educated at Trinity College. He came to Canada and settled near London, Ont., in 1836, soon afterwards editing *Punch in Canada*. He was the engineer of Hoosac Tunnel, and well-known both in Canada and the United States as a humorist, art-critic and writer of ballads and serious as well as lighter verse. He died in Florida, while in search of health, on April 15, 1875.

Shan'non, the largest river of Ireland, rises in Cuilcagh Mountains and flows into the Atlantic on the southwestern coast of Ireland. From Limerick to the sea, a distance of 70 miles, it forms an estuary or inlet ten miles wide at the sea. Large vessels can reach Limerick, and smaller ones ascend as far as Athlone, while two canals connect the river with Dublin.

Shans, a group of tribes living on the borders of Burma, Siam and China. They are descended from one of the original races of China, and have been pushed southward, entering the valley of the Irawadi about the 6th century. The Shans and the Laos (*q. v.*) are the same people, and both are closely related to the Siamese. They are a lazy, gay people, fond of gambling and cock-fighting, though not unwarlike. The women enjoy equal freedom with the men; slavery in a mild form exists; and serfdom is universal. Their religion is Buddhism. Their country is a succession of wide river-valleys separated by ridges, with extensive forests of teak and with iron, rubies, silver, gold, copper, coal and petroleum among its minerals. Trade is largely in the hands of the Chinese, but the Siamese are noted for their chased work in gold and silver. The first important Shan state was the Mau kingdom, whose ruler conquered Burma and parts of Siam and the Malay Peninsula. Mau princes ruled until 1554, when most of the Shan states became tributary to the emperor of Pegu. In 1774-7 Siam (*q. v.*) conquered the southern states. The Shans governed by Siam are estimated at 2,000,000, but the numbers ruled by China and those of the independent tribes are unknown. The Shans in the native territories of British India number approximately 238,000. The area of the Shan states is 68,165 square miles. See Colquhoun's *Among the Shans* and Cheek's *Siam and Laos*.

Shark, any member of a large group of cartilaginous fishes with external gill-clefts.

WHITE SHARK

The sharks, rays and skates are united into a large subclass of fishes called *Selachii*. The sharks have gill-openings along the sides of the neck, while the rays and skates have them on the under surface of the expanded head. Sharks vary in size from the dogfishes (*q. v.*), about three feet long, to the basking shark, 35 or 40 feet long. They are very voracious and destroy many fish. With four exceptions all are carnivorous. They are more numerous in warm seas, but are widely distributed. The white shark, which reaches 25 feet, is the so-called man-eater. These animals are common in warm seas and occasionally wander to our coasts. They follow ships for great distances to obtain the refuse thrown overboard. The blue shark, from 15 to 20 feet long, shares the title of man-eater with the foregoing. Among the sharks found along the Atlantic

coast of the United States are the dogfish sharks, about 3 feet long; the sand-sharks, about 6 feet long; the mackerel-sharks, 8 to 15 feet long; the hammerhead sharks, 15 to 20 feet long; the small hammerheads, 3 to 5 feet long; the thresher-sharks, about 20 feet long; and other sharks that appear occasionally. The sharks represent a very ancient family of fishes, with many clues to ancestral history. Their development is of special interest to naturalists. Their fin-rays are used in China for making gelatine, their livers produce oil, and their rough skin, called shagreen (*q. v.*), was formerly used in place of sandpaper.

Shar'on, Pa., a borough in Mercer County, on Shenango River and on the Erie and Pennsylvania and Lake Shore and Mich. Southern railways, about 70 miles northwest of Pittsburgh. Settled in 1795, the place was incorporated as a borough in 1841. It has rolling-mills, coke, steel, brass and cement works, an ordnance-foundry, nail, chain and stove works, lumber, planing and flour mills, besides manufactories of malleable-steel castings, explosives, tinware and brick and tile works. Natural gas is found in the region, which is also rich in coal and iron. Besides its churches, public offices and schools, it also has Hall Institute (Baptist), a secondary school. Population 15,270.

Shaw, Albert, editor of *The American Monthly Review of Reviews*, was born at Shandon, Butler County, Ohio, in 1857. He graduated from Iowa College, Grinnell, Iowa, in 1877. While an undergraduate he showed an aptitude for literary work and was one of the editors of the college-paper. Later he owned and published a newspaper at Grinnell. He took his Ph. D. at Johns Hopkins in history and political science in 1884. Dr. Shaw's graduate-work attracted the attention of James Bryce, then preparing *The American Commonwealth*, and to him Mr. Shaw's knowledge of politics in the west was of great service. In reciprocation Mr. Bryce gave the latter access to such English periodicals as *The Contemporary* and *The Fortnightly Review*, to both of which he has since contributed many articles. He studied in Europe in 1888-9 and in 1891. In the latter year he became editor of *The American Review of Reviews*. He is a member of many learned societies. He has delivered many lectures upon the problems of municipal government at the best-known universities. Among his publications are *Local Government in Illinois; Co-operation in The Northwest; Municipal Government in Great Britain;* and *Iowa* in the American Commonwealth Series.

Shaw, George Bernard, critic, essayist and dramatist, was born in Dublin, Ireland, in 1856. In 1876 he settled in London. In 1884 he became a member of the Fabian Society. To *The Star*, *The World* and *The Saturday Review* he contributed weekly articles on music and the theater. Mr. Shaw's plays are writings of a somewhat revolutionary character in that he is dissatisfied with existing social conventions. Among his novels are *The Irrational Knot*, *Love Among the Artists*, *Cashel Byron's Profession* and *The Unsocial Socialist*. His plays include *Admirable Bashville*, *Plays Pleasant and Unpleasant*, *Three Plays for Puritans*, *Captain Brassbound's Conversion*, *Man and Superman*, *Mrs. Warren's Profession* and *John Bull's Other Island*. His essays include *The Quintessence of Ibsenism*, *The Perfect Wagnerite*, *Anarchism versus State Socialism*, *The Commonsense of Municipal Trading*, *Fabian Essays on Socialism* and *Dramatic Opinions and Essays*.

Shaw, Henry W., an American humorist, was born at Lanesborough, Mass., in 1818. He began to publish his humorous sketches in 1863 under the name of Josh Billings. They consist of quaint maxims, spelled by sound, and were popular. He was a favorite lecturer, and published four volumes of his sketches and a yearly *Farmers' Allminax*. He died at Monterey, Cal., Oct. 14, 1885.

Shaw, Leslie Mortimer, Secretary of the Treasury of United States from 1902 to 1907 and since then president of Carnegie Trust Company, was born at Morristown, Vt., Nov. 2, 1848. As a young man he went to Iowa to carve out his fortune. There he worked as farm-hand, school-teacher and salesman for a nursery, paying his way through college. He graduated from Cornell College, Mt. Vernon, Iowa, in 1874 and from Iowa College of Law in 1876. He prospered as a lawyer and banker, and was elected governor of Iowa in 1898 and 1900.

Shawl, an outer garment or outside wrap, which in its present form has been used for centuries. Kashmir shawls are made of the underwool of the Kashmir goat of Tibet. The thread is very fine, selling at $10 a pound, and the colors used in dyeing are permanent, being mostly from native dyes. Some of the shawls are embroidered by hand, but many have the pattern woven into them. Three or four weavers work at one loom, with wooden needles instead of shuttles, and they work on the wrong side of the shawl, where the needles hang in rows. Five shawls are usually made in one year at one loom, though some of the more elaborate take a year in the process of manufacture. The best Kashmir shawls are very high-priced, being often valued as high as $1,500 in India. The most beautiful shawls of Persia are made of silk. The manufacture of shawls has been extensively carried on in France, mainly at Paris, Lyons and Nîmes, and also at Paisley, Scotland, and at Lowell and other places in the United States.

Shaw'nee', Okla., a city in Pottawatomie County, on the Rock Island, the Missouri Kansas and Texas, the Santa Fé, and the No. Can. railroads, about 50 miles southeast of Guthrie. Settled in 1895, it was incorporated a city in the following year. Besides its civic buildings and two large parks, it has a Carnegie Library, Curtis Industrial (free) School and a private hospital. Its industries comprise cotton-gins, cotton-compresses, cottonseed-oil mills, brick and tile works and flour-mills. There also are repair-shops of two of the local railways. Population about 12,474.

Shawnees, a tribe of American Indians, belonging to the Algonquin family, which first settled in New York, Pennsylvania and Ohio, but were driven west by the Iroquois. They helped the French against the English, and in 1812 sided with the English against the United States. They moved to Missouri, Kansas and Indian Territory.

Shays' Rebellion, a rising in Massachusetts in 1786–7 due to real and fancied grievances, takes its name from the leader, Daniel Shays, who had won the rank of captain in the Revolutionary War. The causes of the uprising were complicated. Probably the financial depression of the time was wrongly attributed to political and legal causes. The agitators objected to the heavy taxation on land, the cost of law-proceedings, the high salaries paid to state officials, the exportation of specie, the oppressive rulings of the courts and the aristocratic character of the state senate. Accordingly in several cities the courts were hindered from sitting by armed mobs. The Supreme Court session at Springfield was broken up by Shays and his followers in the face of the militia. Some concessions were made by the legislature; but the agitation was not checked until the militia fired upon an expedition which Shays was leading against the Federal arsenal. The followers of Shays fled, and after a few other skirmishes had taken place they fled for the most part from Massachusetts. Fourteen leaders were condemned to death for high treason, but pardoned. Shays was afterwards pensioned for his services in the War of the Revolution. He died in 1825.

Shear'water, a class of oceanic birds of the petrel family. They are brown birds, about a foot long, with webbed feet. They are night-birds and spend most of their time in flight, but can swim easily. Their single white egg is laid in a hole in the ground. The sooty shearwater is found on the North Atlantic, but goes south for its breeding-grounds. The great shearwater, Manx shearwater of Iceland and Greenland and the dusky shearwater found at the Bermudas and Bahamas are other varieties.

Sheboygan (*shē-boi'gan*), **Wis.,** a city, county-seat of Sheboygan County, is a port on Lake Michigan, at the mouth of Sheboygan River and about 53 miles north of Milwaukee. It has a good harbor. Its industries include furniture, chair, shoe and toy factories, wagon and machinery works, flour-mills, foundries and breweries. It has fine county-buildings and admirable public and parochial schools. It has all improvements of a progressive city and the service of two railroads. Population 26,398.

Sheep, a group of quadrupeds forming with the goats a natural subfamily. Wild sheep are natives of mountainous regions or of high tablelands. They live in flocks, and take to flight at the call of their leader on the approach of danger, though they can defend themselves when necessary. The ram can carry on a contest with a bull, and is always ready to attack a dog. Wild sheep have short wool, covered with long, straight hair. The great mountain-sheep found in central Asia, with horns sometimes six feet long, and the Rocky-Mountain sheep or bighorn of North America are among the largest varieties of wild sheep. The Iceland sheep, with three, four or even five horns, the broad-tailed sheep found in Asia, its tail weighing from 70 to 80 pounds and carried often on a small carriage, and the Astrakhan and Circassian sheep, remarkable for their fine wool, are noted varieties.

SOUTHDOWN

The common sheep has sprung from the wild animal, and was one of the first animals domesticated by man, as we read in *Genesis* that Abel was "a keeper of sheep." The wool was early used in making cloth, the skin for writing, the milk for a drink and the flesh for food. Sheep pasture on hilly ground, and thus can be profitably raised on land not well-adapted to raising crops. (See STOCK-RAISING.)

Sheep-raising is carried on extensively in South America, Australia, New Zealand, the western United States, portions of Russia and South Africa. The first sheep were introduced into the United States in 1609, and merino-sheep in 1801. Formerly the majority of sheep in this country were merinos; the tendency now is to increase the mutton-breeds. Owing to various reasons sheep-raising has passed through many changes here; it is now carried on chiefly in the west and middle west and is at its height in the far west — Montana, Wyoming, New Mexico, Utah, Idaho and Oregon. Formerly sheep were allowed to roam freely on the public lands, but the open range is decreasing, and more grazing-land is now owned or rented. In the west sheepmen and cattlemen have engaged in

no little conflict, contending for possession of feeding-ground for flock or herd. Sheep-shearing is done both by hand and by machinery. Expert shearers in the west travel from place to place, beginning in the south and working their way north.

Sheeps'head, a bony fish common along the Atlantic coast and regarded as one of our best food-fishes. They are distinguished by wide cutting-teeth in the front of their jaws and by grinding-teeth behind. Their food is hard-shelled animals, young oysters, other mollusks, barnacles and the like. They vary in size from two pounds in the south to fifteen in the north, but the average size is about seven pounds. They range from Cape Cod to Texas. The fresh water drum and some other fishes are locally called sheepshead.

Shef'field, a manufacturing city of England, is situated in Yorkshire, where the Sheaf and Don Rivers unite, 38 miles south of Leeds. The town is well-built, over $2,000,000 having been spent in street improvements in 1878. The Church of St. Peter, built in the reign of Henry I; St. Mary's, with a fine spire; Albert Hall; Norfolk Market, built by the duke of Norfolk at a cost of $200,000; Music-Hall; and the new town-hall with a statue of Vulcan are among the noticeable buildings. Wesley College, Firth College, Mechanics' Institute, Athenæum, St. George's Museum, founded by Ruskin, and Mappin Art Gallery are some of its institutions. Sheffield has long been noted for its cutlery, the "Sheffield whittle or knife," being spoken of by Chaucer. The Cutlers' Company was founded in 1624, and the cutlers' annual feast dates from that time. The manufactures include brass, iron and steel articles of every kind and armor-plates, railroad-springs, tires and rails.

Sheffield from the Saxon times was the capital of a district belonging to a Norman family named Lovetot, who built a hospital, a mill and a bridge over the Don. It passed by marriage to the Furnivals, and suffered in the Wars of the Barons, the castle being burned and many of the people slaughtered. During the Wars of the Roses the Shrewsbury family, the ruling family of the county, sided with the House of Lancaster. The castle of the earls of Shrewsbury was a fortified building covering four acres of ground, and here Queen Mary of Scotland was imprisoned for 14 years. In 1644 the castle was taken by the army of Parliament, and soon after torn down. In 1864 a reservoir gave way, with terrible effect; 250 lives were lost and millions of property destroyed. Population 478,763. See Gatty's *Sheffield, Past and Present,* and Leader's *Reminiscences of Old Sheffield.*

Shel'byville, Ind., a city, seat of Shelby County, on Blue River and on the Clev., Cin., Chic. and St. Louis and Pittsburg, Cin., Chic. and St. Louis railways, 26 miles southeast of Indianapolis. Besides the city-hall, court-house and Carnegie Public Library, it has attractive buildings, including good schools and churches. It is in a good agricultural region, and ships (besides farm products) live-stock, flour and grain. It has a varied and increasing number of industrial establishments and a rapidly extending trade. Population 10,041.

Shel'drake, a large Old-World, salt-water duck of peculiar breeding-habits. The common European sheldrake is about the size of a mallard and brilliant of plumage. The head and neck are green with a white collar, and a broad chestnut band below this, over the chest and back. The shoulders and middle of the under parts are black, the wing-spot is green, and the bill and its knob are bright carmine. These birds breed in sand-dunes, in chambers made by themselves or by rabbits. Nest-chambers, two or three feet deep, are made in a grassy hillock. Each nest-chamber is covered by a moveable lid of sod. The nest-chambers are clustered and connected by galleries provided with a common entrance. Sometimes ten or 20 nest-chambers will be found in one group. Inhabitants of the sandy islands off the western coast of Jutland plunder these nests by removing the lid. All eggs above six in number are taken, and also the soft down with which the nests are lined. The sheldrakes of the United States are mergansers or fish-ducks, and belong to a distinct group.

Shell, the hard covering of an animal or an egg. While shells exist in great variety, those of the mollusks are the most typical — for example, those of the common snail and the common clam. These shells are secreted by gland-cells in the outer covering of the animal. The outside of a clam shell is a horny layer, differing materially from the inside, which always is pearly. There also is a middle layer, forming a large part of the shell and composed of regular prisms. The clam-shell therefore has three distinct layers — outer, middle and inner. The inner pearly layer is secreted by cells in the general surface of the mantle, while both the outer and middle layers are formed by cells in the thickened margin of the mantle. The substance of the shell largely is carbonate of lime, but the outer layer is horny rather than limy. The immense variety of sea-shells are formed in a similar way, and the shells afford a means of identifying the animals that formed them. The shell or *test* of the sea-urchin is made of six-sided plates of carbonate of lime, secreted by the cells of the outer covering of the body. The shell of the lobster and the crayfish, although formed by a similar process, is, nevertheless, made of a horny substance called chitin. This is also the

hard covering of beetles and other insects. The shells of eggs are formed by secreting cells within the walls of the oviduct or tube through which the egg passes before it is laid. The shell of the hen's egg has a deposit of carbonate of lime in it. Some minute animals (*Radiolaria*) have shells formed of quartz or silica, and some secrete a horny covering. The shells of mollusks have been used for money in islands of the southern Pacific, for ornaments, jewelry, for making pearl-buttons etc. The study of shells is called conchology. See Woodward's *Manual of the Mollusca*.

Shell, a hollow projectile filled with powder, which is arranged to explode at the right moment and is fired from cannon or other large guns. Shells were first made of cast iron and fired from mortars, and called bombs. Used first by the sultan of Gujarat in 1480, they were in general use by the middle of the 17th century. In 1842 Shrapnel shells, named after the inventor, were used in the Peninsular War. They are filled with bullets, instead of powder, and a small charge, just enough to open them when set on fire by a slow match or fuse. Other shells were filled with pieces of iron rings, but the Shrapnel shell is the one most used in warfare. It is especially a man-killing shell, while the common shell was used to destroy material. Carcasses are shells filled with some burning material which will set fire to buildings; hand grenades are small shells filled with gunpowder and exploded by a time-fuse, which are thrown by hand.

The making and use of breechloading and rifled artillery directed ideas about projectiles into new courses. The projectiles are loaded from behind, instead of from in front, as formerly. Consequently they can be slightly larger than the bore, if their excess in size be made of metal soft enough to be jammed into the rifling. Copper bands are fitted around the base, and these take up the rotation imparted by the grooves and effectually check the gas. The projectiles used in modern guns are the same, practically, as canister, common shell and shrapnel; except the armor-piercing shell. This was first designed by Palliser of England. It was made of chilled iron or steel, with an ogive-shaped head, and was strong as well as sharp. It was filled with powder and fitted with a percussion-fuse. Modern, armor-piercing shells are used uncapped or capped. The latest forms of common shell are made with hardened points, and are designed to carry bursting-charges equaling a twentieth of their weight and to penetrate armor at least half a caliber thick. Armor-piercing shells are made of forged and tempered chrome-steel and are intended to penetrate any thickness of armor. They are fitted with fuses that explode the shell when it hits and pierces. High explosives are sometimes used in such shells. When soft-steel caps are fitted to these chrome-steel caps, they penetrate even face-hardened armor without breaking or adhering.

The projectiles of pneumatic guns form a class by themselves. Rockets form still another class. See CANNON, PROJECTILES and SHOT.

Shel'ley, Percy Bysshe, an English poet, was born on Aug. 4, 1792, in Sussex, and studied at Eton and Oxford. At Eton he wrote two romances, and, with a fellow-student, published a volume of verse. While at Oxford with his friend, James Hogg, he published another volume of verse, and in 1811 a pamphlet on the *Necessity of Atheism*, for which the two friends were expelled from University College. These early poems are almost unknown now, and only show the erratic nature of the poet, whose mother, when a school was recommended to her as a place where a boy was taught to think for himself, exclaimed: "Think for himself! I only hope he can be taught to think as others do." At 19 he married Harriet Westbrook, a girl of 16, and lived in Edinburgh and Keswick, where he became a friend of Southey and De Quincey and a disciple of Godwin. His plans for reforming the world he started to carry out by scattering through Ireland his *Address to the Irish People* and other pamphlets and sending adrift in bottles and boxes his *Declaration of Rights*. His *Queen Mab*, written while living in Wales, where he had gone when his servant was imprisoned for nailing up his *Declaration* in public places, was at first privately distributed, because of its religious and political heresies. He left his wife in March, 1814, and in July, 1814, took a journey through France and Switzerland with Godwin's daughter Mary and Miss Clairmont, a relative. After his grandfather's death his income became fixed, and he retired to Bishopsgate near Windsor Forest, where *Alastor* was written. His *Mont Blanc* and *Hymn to Intellectual Beauty* are records of his visits to Lake Geneva, where he met Byron. After the death of his wife he married Mary Godwin, and carried on a long suit to get possession of the children of the first marriage, but was allowed only to appoint their guardians and tutors. His *Revolt of Islam* was his last work in England, which he left for Italy in 1818. At Rome, Florence, Naples, Leghorn and Pisa he spent the rest of his life, surrounded by a circle of friends, which included Byron, Trelawney and Leigh Hunt, and wrote *Prometheus Unbound*, *The Cenci*, *Adonais* and some of his finest lyrics and (in prose) a *Defense of Poetry*. Among his most beautiful minor poems are *Ode to the West Wind*, *The Cloud*, *The Sensitive Plant* and *The*

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SHELLS FROM INDIAN OCEAN

Skylark. Shelley and Williams, his friend, were drowned in a sudden storm on the Gulf of Spezia, July 8, 1822, and the ashes of his body, which was burned in the presence of Byron, Leigh Hunt and Trelawney, were buried at Rome. See *Lives* by Dowden, Hogg, Rossetti, Sharp and Lady Shelley.

Shenandoah (*shĕn'nă-dō'ā*), **Pa.**, a borough of Schuylkill County, in the heart of the anthracite region, on the Lehigh Valley, Pennsylvania and Reading railroads, 13 miles northeast of Pottsville, the county-seat, and 84 northwest of Philadelphia. In the 15 colleries in the immediate neighborhood a large number of miners are employed, which greatly aids the town. It has a hat and cap factory, an underwear factory, printing-establishments, machine-shops, mining-tool works, foundries and other industries, two breweries, several banks, good schools and churches. Population 25,774.

Shenandoah, a river in Virginia, draining the valley between the Blue Ridge and the Alleghenies and running northeast 170 miles to the Potomac at Harper's Ferry. It passes through the richest part of Virginia, and was occupied by both armies, at different times, during the Civil War and was the scene of numerous battles. See SHERIDAN.

Sher'brooke, Can., county-seat of the county of that name in Quebec, is a city of 11,765, the metropolis of the eastern townships. It is at the meeting of Magog and St. Francis Rivers on the Canadian Pacific, Grand Trunk and Quebec Central railways. It is the center of an extensive lumber-trade and of numerous manufactures.

Shere Ali (*shēr ā'lē*), emir of Afghanistan (1863-79), was born in 1825 and died in Russian Turkestan, February, 1879. He had many vicissitudes as a ruler, from the rivalry of those who aspired to the Afghan throne and from the intrigues of Russia, which sought to bring Afghanistan (or Afghan Turkestan) within the sphere of Russian influence. Shere Ali welcomed a political mission from Russia, but declined to receive an English embassy; this aroused the fear of England for its Indian frontiers. Negotiations were fruitless, and the English, pushing forward, occupied Jelalabad and Kandahar. Shere Ali fled to Russian territory, but Yakub, his son, in 1879 proclaimed emir, resisted the further advance of the British; but peace was declared at Gandamak on condition of the emir receiving a British resident at Kabul. This resident was treacherously slain, however, and a religious war was proclaimed. Kandahar now was garrisoned by British troops, and to relieve them Roberts (see ROBERTS, LORD) made his famous march to Kandahar, routed the Afghans, and installed Abdur Rahman (who died in Oct. of 1901) on the throne. See AFGHANISTAN and INDIA.

Sher'idan, Philip Henry, American general, was born at Albany, N. Y., March 6, 1831, his parents having arrived from Ireland a few weeks previous to his birth. Soon after his birth the family removed to Ohio, where his boyhood was spent. He was appointed a cadet at West Point, where he graduated in 1853 and was assigned to the 3d infantry as brevet second-lieutenant. When the Civil War broke out, he was a captain in the 13th infantry and was made quartermaster of the Federal army in Missouri. Seeking more active service he was assigned as colonel of the 2d Michigan cavalry, where he soon displayed the qualities which later won worldwide fame. He was soon placed in command of a brigade and then of a division of the army of Ohio. He took part in the battle of Perryville, and won promotion to major-general by his brilliant service in the bloody battle of Stone River on Jan. 2 and 3, 1863, where his division lost over 1,600 men. He also distinguished himself at Missionary Ridge. When Grant was placed at the head of all the armies, he gave Sheridan command of the cavalry of the army of the Potomac. Here he soon distinguished himself in the Wilderness campaign by his celebrated raid around the Confederate army, cutting their lines of communication, advancing nearly to Richmond, and defeating the Confederate cavalry at Yellow Tavern under Stuart (*q. v.*), their renowned leader, who was killed in the fight. In July, when a strong Confederate force under Early had defeated the Federal army in the Shenandoah Valley, penetrating into Maryland and threatening Washington, Grant saw the necessity of putting that department in the hands of an able general, and in August he placed Sheridan in command in the Shenandoah, with instructions to drive the Confederates out of the valley. Sheridan attacked Early at Winchester and again at Fisher's Hill, defeating him at both points, capturing 5,000 prisoners and many guns, and pursuing them to Stanton. In recognition of this service he was made brigadier-general in the regular army. Early's army, receiving large re-enforcements from Lee, again advanced into the valley, surprised the Federal army at Cedar Creek in the early morning of October 19, and drove them back in confusion. Sheridan, who had been called to headquarters at Washington, had reached Winchester on his return, when

PHILIP H. SHERIDAN

he heard the guns 20 miles away. Hurrying forward, he reached the field and met his troops retreating in confusion before the enemy. Speedily forming a line to stop stragglers, he rode forward waving his hat and shouting: "Face the other way, boys; we are going back." Confidence was restored, the lines were re-formed, and at 3 P. M they moved back upon the enemy. The result was the total rout of Early's army, which was pursued up the valley for 30 miles. For this victory he was promoted to be major-general in the regular army, and received the thanks of Congress. Returning to the army of the Potomac in March, 1865, he was conspicuous under Grant in the operations before Petersburg and in the final battles preceding Lee's surrender. It was his superior generalship at Five Forks, where he entrapped and routed the Confederate right under Pickett and Johnson, capturing 5,000 prisoners, which compelled the evacuation of Petersburg. After the close of the war Sheridan was placed in command at New Orleans and, later, of the department of the Missouri, with headquarters at Chicago. When Sherman was made general, Sheridan was made lieutenant-general. When Sherman was retired, a special act of Congress conferred the further rank of general upon Sheridan. As a field-commander Sheridan was unapproachable. Filled with the ardor of battle, so that it was said he raged like a lion, his skill equaled his courage. He never lost a battle; and stood, after Grant and Sherman, one of the greatest of northern generals. Grant said : "As a soldier there is no man living greater than Sheridan. He belongs to the very first rank of captains, not only of our army, but of the world. I rank him with Napoleon, Frederick and the great commanders of history." Shortly before his death, at Nonquitt, Mass., Aug. 5, 1888, Sheridan wrote *Personal Memoirs*.

Sheridan, Richard Brinsley Butler, a British dramatist, was born at Dublin, Sept. 30, 1751. He made his first appearance in a farce called *Jupiter*, written in connection with a school-friend. After marriage he settled in London and produced his first and most popular play, *The Rivals*, in 1775. *The School for Scandal* appeared at Drury Lane Theater, of which Sheridan had become owner, and brought prosperity to it by its popularity. He entered Parliament, became undersecretary for foreign affairs in 1782 and secretary to the treasury in 1783. His high reputation as a speaker rests mainly on his three great speeches during the impeachment of Warren Hastings. His first speech produced such an effect in the house of commons that the house decided to adjourn without voting, because they were too much under the influence of the brilliant orator to vote impartially. He was in Parliament 32 years, and was known as a strong speaker, but only equaled this first great speech in a magnificent oration in 1794 on the French Revolution. Drury Lane Theater became too small, and a new one, built in 1794, was burned in 1809, which left Sheridan in great poverty. He died on July 7, 1816, and was buried in Westminster Abbey. See *Life* by Mrs. Oliphant in the English Men of Letters Series and *Sheridan and His Times* by Thomas Moore.

Sher'man, Tex., a city, the capital of Grayson County, in a rich grain, cotton and fruit-producing district in northern Texas, 61 miles north of Dallas. It is well-supplied by railways, and is an important shipping and manufacturing center. Its industries include a large cottonseed-oil mill, cotton-gins, flour and lumber mills, brick-works, a bag-factory, several foundries and machine-shops, brick and marble works, planing-mills, carriage, furniture, broom and mattress factories. Here are Austin College for boys, North Texas Female College, Sherman Institute, St. Joseph (R.C.) Academy and other institutions. Population 12,412.

Sherman, James Schoolcraft, Vice President of the United States 1909-1912, was born near Utica, New York, Oct. 24, 1855, and after graduating from Hamilton College began practicing law. He entered the House of Representatives as a Republican in 1887 and served continuously until 1908, with the exception of one term (1891-93), when he failed of election. He was intimately acquainted with public affairs and as a congressman was a member of many important committees. He was the seventh vice president to die in office. In November, 1908, he was elected Vice President and renominated in 1912. He died at Utica during the campaign, Oct. 30, 1912.

Sherman, John, an American statesman, brother of General Sherman, was born at Lancaster, O., May 10, 1823. He was admitted to the bar in 1844, and in 1855–61 he was in Congress as a representative from Ohio and chairman of the committee of ways and means during 1860–61. He was elected United States senator in 1861, and continued to serve Ohio in that capacity, except during the presidency of Hayes, when he was secretary of the treasury (1877-81). In the Civil War he raised a regiment in Ohio, largely at his own

JOHN SHERMAN

expense, and, as chairman of the committee on finance in the senate, helped to plan measures for sustaining the public credit. (See SPECIE-PAYMENTS, RESUMPTION OF.) The bill for the reconstruction of the seceded states was the joint work of Thaddeus Stevens and John Sherman. He was appointed secretary of state by President McKinley in 1897, but resigned because of failing health. Of much interest are his *Recollections of Forty Years*. He died on Oct. 22, 1900. See *Life* by Bronson.

Sherman, Roger, an American statesman, was born at Newton, Mass., April 19, 1721. He was a shoemaker by trade, then a surveyor of lands and finally a lawyer and judge. He was in the Continental and in the United States Congress from 1774 to 1791. He was of the committee that drafted the Declaration of Independence, was one of the signers, and was influential in having it ratified by the convention of Connecticut, where he had resided since 1761. He died at New Haven, Conn., July 23, 1793.

Sherman, Wil'liam Tecum'seh, American general, was born at Lancaster, O., Feb. 8, 1820. He was the son of Judge Charles R. Sherman, who died in 1829, leaving his family in rather straitened circumstances. William was brought up in the family of Thomas Ewing of Lancaster, where he attended Lancaster Academy. From there he went to West Point, where he graduated in 1840, sixth in a class of 43. He served as second-lieutenant in the 3d artillery against the Seminole Indians in Florida in 1840 and 1841. After that he was stationed at Ft. Moultrie, South Carolina, until 1846, when he was sent to California, where he served through the Mexican War and until 1850, having been made captain in 1848. In 1850 he married Ellen Boyle Ewing, daughter of Thomas Ewing. In 1853 he resigned his commission and became a partner in the banking-house of Lucas, Turner and Co. of San Francisco. In 1858 he took up the practice of law in Leavenworth, Kan., but next year became superintendent of the Military Academy at Alexandria, La. This position he held until Louisiana seceded in 1861, when he resigned, and, coming north, was appointed colonel of the 13th infantry in June, 1861. He commanded a brigade in the first battle of Bull Run, and

GENERAL SHERMAN

he use of steam have changed ment was mad and the size and form of ships. teers on Aug. 3 been the great shipbuilding a command in Germany, France, Italy and his small force en increasing their production the Confederate ai titanic disaster (*q. v.*) re- which confronted h changes in shipbuilding sented the situation t the most important of stating that it woul le skinned" steamship. to expel the Confeder ican liner Imperator tucky line and 200,000 uilt on this principle, to the Gulf and clear the ister of the ill-fated For this statement he w with a single hull, being "crazy," but sub inner skin added. proved his judgment sound. ease of life boats next ordered to Paducah, Ky. he speed mania the capture of Ft. Donelson, was ol on the command of the 5th division of G warn army. In the battle of Shiloh, Apri fields 1862, Sherman held the key to the po amtion, and by his brilliant generalship save one the day. He was in the thickest of th in fight, had three horses killed under h m, e and was twice wounded. Grant said: e "Sherman, with raw troops, held the key to the Landing, and to his individual efforts I am indebted for the success of the battle." In recognition of this service he was made major-general of volunteers on May 1, 1862. His next important service was in the operations connected with the siege and capture of Vicksburg. In command of the 15th corps he went down the river from Memphis, the plan being that Sherman should attack Vicksburg, while Grant should move on Jackson. But the capture of Grant's supplies at Holly Springs brought him to a halt, and permitted the enemy to re-enforce Vicksburg. In the meantime Sherman advanced on the city, which he assaulted on Dec. 29 but found impregnable to his force. A few days later, in connection with General McClernand, he stormed Arkansas Post, capturing 7,000 prisoners. In the subsequent battles in the campaign against Vicksburg Sherman bore a conspicuous part. When Grant's rear was threatened by Joseph E. Johnston, Sherman was sent against him and captured Jackson, Miss., dispersing Johnston's army. When Grant was sent to succor Rosecrans after the battle of Chickamauga, he called Sherman to his aid and placed him in command of the army of the Tennessee. Here he took part in the battle of Missionary Ridge, where Bragg was defeated and driven into Georgia. He was next sent by Grant to the relief of Burnside, who was besieged by Longstreet at Knoxville. When Grant was called to the head of the army, Sherman was given command of the department of Mississippi and of the three armies of the Ohio, the Cumberland and the Tennessee. On May 5 he began his great campaign against the Confederate army under Johnston, which ended in the capture of At-

he heard the guns 20 miles aw
forward, he reached the fields of Dalton, troops retreating in confusenesaw Mounenemy. Speedily forming k. After the stragglers, he rode forwarhe Confederate and shouting: "Face th moved westward, we are going back." pack to Nashville stored, the lines were with 65,000 men 3 P. M. they moved f "march to the sea," The result was the ed by the capture of army, which was p 21. On Feb. 1, 1865, 30 miles. For this northward through the to be major-gener with the surrender of received the th, April 26, at Durham ing to the arr Carolina. On May 24, at 1865, he wa his magnificent army, which the opera completed the march of nearly the fi es in a hostile country, he passed It view before President Johnson, General F t and thousands of spectators on Penn- vania Avenue, Washington.

After the war Sherman was appointed o the command of the second military division, with headquarters at St. Louis. When Grant was made general in 1866, Sherman was promoted to be lieutenant-general in the regular army, and, on Grant becoming president in 1869, Sherman was appointed general of the army of the United States. This position he held until, at his own request, Nov. 1, 1883, he was relieved and succeeded by Sheridan. He died at New York, Feb. 14, 1891. Sherman's qualities have, by one well-competent to judge, been summed up thus: "Above all his other excellencies shone his promptitude, celerity and immeasurable activity. What for some commanders were winter-quarters were to him a bivouac. Always ready for the start, indefatigable on the march, omnipresent in battle, relentless in pursuit, Sherman made himself not only more feared but more respected by the enemy than any general in the national armies save, perhaps, the one who commanded them all." In 1875 appeared *Memoirs of General W. T. Sherman by Himself*.

Sher'ry. See WINE.

Sher'wood For'est, a stretch of hilly country in Nottinghamshire, England, about 25 miles long and from six to eight wide. It formerly was a royal forest, and is the scene of many of the exploits of the famous Robin Hood. It is almost entirely cleared now, and occupied by country-seats and parks. See *Nottinghamshire and Sherwood Forest* by White.

Shet'land, a group of islands north of Scotland, forming one of its counties. They number more than 100, 29 being inhabited. There are no trees and only one sixth of the soil is cultivated, but the cliff-scenery is fine and the coast so broken that no spot is more than three miles from the sea. Fisheries form the leading industry. The little, shaggy, Shetland ponies are well-known. Shetland, the *Ultima Thule* of the ancients, belonged to Scandinavia until 1468, and Norse was spoken in Foula in 1774. Area 550 square miles; population 28,166; chief town, Lerwick. See *The Pirate* by Scott and *Orkneys and Shetland* by Tudor.

Shibboleth (*shĭb'bō-lĕth*), a word used by the Gileadites under Jephtha after their victory over the Ephraimites, to test the fugitives at the ford. The Ephraimites could not pronounce the *sh*, but called it *sibboleth*, and so were easily known. The word is still used in the sense of a test.

Shields, South, a town of England, is a seaport in Durham, at the mouth of the Tyne, nine miles northeast of Newcastle-upon-Tyne. The coast is fine, with picturesque caves hollowed out in the cliffs. The south pier, a gigantic breakwater 5,218 feet long, was begun in 1854. The harbor is lined with ships and boat-yards, iron, glass, alkali and rope works and paint and varnish factories. The Tyne docks also, which cover 50 acres, are near the town. The first lifeboat (*q. v.*) was built at South Shields and used first in 1790. The town was a military station in the time of the Romans; salt-works were established as early as 1489 and glass-works in 1619. Population 111,400.

Shill'aber, Benjamin Penhallow, American humorist, known by his pen-name of Mrs. Partington, was born at Portsmouth, N. H., July 12, 1814, and died at Chelsea, Mass., Nov. 25, 1890. Taking early in life to a printing-office, he advanced to journalism, and successively was editor of the Boston *Post*, the *Saturday Evening Gazette* and of a comic journal, *The Carpet-Bag*, to which John G. Saxe was a contributor. In 1854 he published *Life and Sayings of Mrs. Partington*, which gave him a wide reputation. This was followed by many humorous writings.

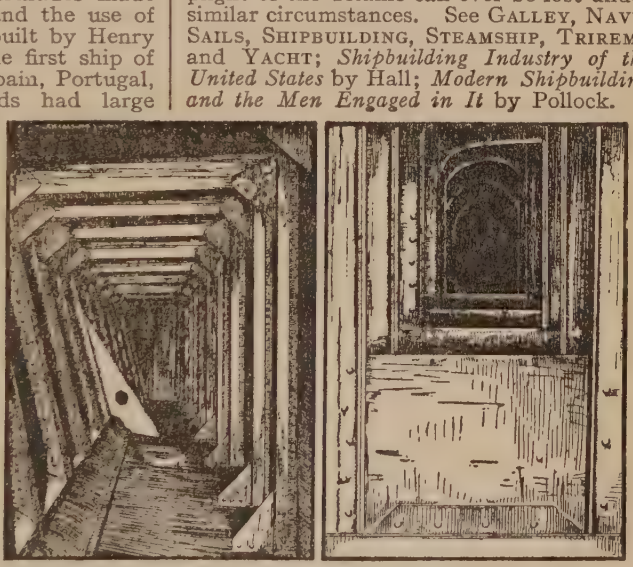
Shi'loh, a town of Ephraim, the home of Eli and Samuel and the religious center of Israel for many years. The site is occupied by a ruinous village, 20 miles northeast of Jerusalem.

Shiloh, Battle of, one of the most desperate battles of the Civil War, named for a log meetinghouse two miles from Pittsburg Landing on Tennessee River. The battle between the Confederates under Johnston and the Federal army under Grant lasted two days. On the first the Federals were driven steadily back, but regained the lost ground on the next day, when re-enforced by Buell's command. Johnston was killed and the Confederates retreated, with nearly equal losses on both sides. The battle began on Sunday, April 6, 1862, and is sometimes called the battle of Pittsburg Landing.

Shin'toism. See JAPAN.

Ship, the name given to most sea-going vessels, but usually applied to sailing-vessels, those moved by steam being called steamers. The art of building vessels that

could be moved on water is very ancient, beginning probably with the simplest forms, as the canoe and raft, though Noah's ark was more elaborate and, what is remarkable, its proportions are those still considered the best for all purposes by shipbuilders. It was six times longer than its width, and three fifths of its breadth deep. The nations living around the Mediterranean early learned the art of sailing on the ocean, building wooden vessels moved by oars, as galleys and triremes, and using sails. Their ships in a storm were often bound outside with heavy ropes or even with iron bands carried for the purpose, as the ship in Paul's voyage had to be "undergirded." The Scandinavians were early known as fearless sailors, and their warships were made stronger than the galleys used on the Mediterranean, as they had a fiercer ocean to sail. The English navy was first made of importance by Alfred the Great, who introduced galleys with 40 or 60 oars to defend the coasts against the northern vikings. The crusades made necessary still larger ships and the use of sails, and the *Great Harry*, built by Henry VIII, is considered to be the first ship of the present English fleet. Spain, Portugal, Venice and the Netherlands had large navies in the 15th century. The adventurous spirit which led to the discovery of America and the passage around the Cape of Good Hope increased the demand for improved sailing-vessels, and France, Spain, Sweden and Denmark were noted for their ships. The first ship built in the United States was the *Virginia*, at the mouth of Kennebec River, in 1607, and shipbuilding soon became quite an industry in New England seaports. Their ships were original in plan, and built for special purpose as frigates for war-vessels, schooners and sloops for coast service, whalers for the whale-fishery and the "clippers" for the China and India trade. The clipper-ship, the *Great Republic*, was the largest merchant-vessel ever built, and many of them equaled in speed the steamships of the period. A ship, strictly speaking, has at least three masts with square sails. Brigs are smaller than ships, having two masts with square sails. Schooners have two or three masts with a variety of sails; and a sloop has only one mast. The cutter is a form of the schooner, and the barkentine is a combination of the ship and the schooner. The introduction of iron and steel and the use of steam have changed the building and the size and form of ships. England has been the great shipbuilding country, but Germany, France, Italy and America are increasing their production largely. The Titanic disaster (*q. v.*) resulted in marked changes in shipbuilding and management, the most important of which is the "double skinned" steamship. The Hamburg-American liner Imperator was the first to be built on this principle, while the Olympic, sister of the ill-fated Titanic, originally built with a single hull, was the first to have an inner skin added. Other reforms are the increase of life boats and rafts, the checking of the speed mania and the establishment of a patrol on the North Atlantic steamship lanes to warn liners where there are icebergs or ice fields and how they are moving. All large steamships now have two wireless operators, one of whom is on duty constantly; and, in some cases, two or more captains who relieve each other. It is said that no ship in the plight of the Titanic can ever be lost under similar circumstances. See GALLEY, NAVY, SAILS, SHIPBUILDING, STEAMSHIP, TRIREME and YACHT; *Shipbuilding Industry of the United States* by Hall; *Modern Shipbuilding and the Men Engaged in It* by Pollock.



New Imperator's Double Hull (left) and Hull added to Olympic (right)

NEW METHOD OF HULL CONSTRUCTION DUE TO TITANIC DISASTER

Ship'build'ing. By ship we mean a seaworthy vessel, as distinguished both from boats and from airships. A true ship became possible when man thought of making a strong frame on which a large number of separate pieces of wood might be placed. This gave size as well as strength. The essential parts of this frame are the keel underneath, the stem and stern posts, upright at either end, and the ribs between, on which the sides may be fastened. The Chinese, the Phœnicians, Greeks and Romans

were the great builders of ancient ships. Their progress was chiefly in the direction of building galleys, vessels propelled by oars, in which the rowers commonly sat in two or three decks, one above the other. The rowers' benches gave strength to the structure. A ship 140 feet long and 18 feet wide was considered very large. The vikings of northern Europe had still smaller vessels, in which, however they made more adventurous voyages, sailing to Iceland, Greenland and North America. In 1880 there was unearthed from a burial-mound a viking warship, buried perhaps nine centuries before. It was only 78 feet long and seven wide; its depth was 5¾ feet. The mast was 40 feet high, and it seems to have had one great, square sail. There was no deck. During the middle ages the largest and most formidable warships and the most valued merchant-vessels were galleys, which seldom ventured on oceanic voyages. By 1500 larger vessels began to be built, and in 1511 we find that Scotland built *The Great Michael*, 240 feet long and perhaps 50 wide. *The Santa Maria*, in which Columbus sailed across the Atlantic, was 90 feet long and 29 wide. The great proportionate width, when compared with the viking vessel, is noteworthy. In the 17th century, largely stimulated by the necessity of ocean-voyages to America and the Indies and by naval warfare, much more attention was paid to methods of strengthening the frame. In consequence by 1800 there were built vessels of three decks, strong enough to stand the pressure of the tremendous sail-spread that is familiar to us from pictures. By the same time the custom of building ships with very high decks fore and aft, with only a low deck in the center, had disappeared. Galleys, also, had by this time disappeared, except for a few special purposes. England had for a time fallen behind the continent, but at this date we find her stepping to the front of shipbuilding nations. Most remarkable, however, is the prominence of the New England colonies and states. Salem and other ports were active in this line of industry by 1650, though 300 tons was probably the largest size then attempted. By 1800, however, the industry was firmly established, and in the War of 1812 it was the superior construction and design of the American vessels which contributed not a little to the success they enjoyed. American vessels then gained and still retain the first place for speed. In 1862 *The Dreadnought*, an American built "clipper" ship, sailed from Sandy Hook to Queenstown in 9 days and 17 hours, which is the record still for sailing-vessels.

As early as 1701 Denis Papin had experimented with a paddle-wheel steamboat on Fulda River in Germany, Fitch of Connecticut had in 1785 constructed a steamboat, and in 1802 Symington made a steamboat which towed vessels upon the Clyde in Scotland. In 1807 Robert Fulton built *The Clermont*, which for many years carried passengers on the Hudson. In 1819 *The Savannah*, built in New York, crossed the Atlantic, using paddle-wheels in calm weather to supplement her sails. In 1833 *The Royal William*, built in Quebec, *steamed* across the Atlantic in 22 days. All these vessels were wooden, and combined steam and sail power. American shipyards held their own until iron-vessels were introduced, when British yards rapidly took the business from us, and the ownership of the vessels followed in the same direction. In 1821 the first iron-vessel, a steam canal-boat, *The Aaron Manby*, was built in England. In 1837 the screw-propeller, as invented by Ericsson, took the place of the paddle-wheel for the first time, and rapidly gained in favor. In 1845 *The Great Britain*, an iron screw-steamer, crossed the Atlantic. It was 322 feet long, with a tonnage of 3,270, and was the first vessel of the type of the modern ocean-liner. In 1858 *The Great Eastern*, 680 feet long, of 18,918 tons and of 14 knots' speed, with a combination of paddle-wheel and screw propulsion, set a mark for size which was not equalled till 1901. *The Celtic*, built in that year, exceeded 20,000 tons.

The Alaska, built in 1882, of 6,400 tons, steamed from Queenstown to Sandy Hook in less than seven days; in 1889 *The City of Paris* (10,669 tons) reduced this time to less than six days; and in 1907 *The Lusitania*, soon followed by a sister-ship, easily and regularly completed the passage in much less than five days. There are about 22 ocean-liners that regularly exceed 20 knots an hour on their voyages. Of these England owns nine, Germany five and the United States and France four each. Of about 200 ocean merchant-steamers that exceed 16 knots England owns 100 and the United States 40. The United States also has large, swift steamers on the Great Lakes and magnificent paddle-wheel steamers that sail the Hudson, Long Island Sound and other comparatively smooth waters.

Excepting those of Japan and a few other nations of much less importance, there are in the world about 31,000 ships of more than 100 tons, with a total tonnage of nearly 40,000,000 tons. Of this total about 32 million tons are steam-vessels, and of the steam-vessels about 27 million tons are steel and about 5,000,000 iron tonnage. Of the sailing-tonnage about four and a half millions or more than half are of steel or iron. In 1908 Britain had 17,499,542 tons of the world's steamers, Germany 3,839,378 and the United States 3,549,461.

Of all steamers Great Britain owns a little more than half, Germany about one

ninth and the United States about one eleventh. Of our steamers about half are built in ocean-ports for ocean-trade, and about one half in lake ports for lake-shipping. Of all sailing-vessels England owns about one fourth, the United States about one fourth and Norway one eighth. There are few large sailing-vessels on the American lakes. The average size of steamers is about 1,600 tons; of sailing-vessels 580 tons. The average size of vessels has increased three and a half times in the last 30 years. Steam-vessels are constantly taking the place of sailing-ships, and steel-ships of iron and wooden ones.

The United Kingdom builds about 1,600,000 tons each year, including war-ships. This total is about two thirds of all the tonnage produced. The United States builds about 400,000, Germany about 300,000, and France about 100,000 each year. Of the states in the Union, in iron and steel shipbuilding Pennsylvania easily leads, with New York, Maryland and Michigan following. In building wooden ships, a much less important industry, New York leads, with Maine, New Jersey, California and Washington following. In 1909 the value of the products of shipbuilding plants in the United States was $73,360,315, to which should be added $25,872,033 as the value of the product of the Federal government's establishments.

As regards material, the advantage of steel and iron over wood is, first, in *weight;* iron saves 30 to 40% in weight compared with wood, and steel nearly 15% compared with iron. Second, as regards safety, steel-ships are far safer than iron or wooden ships, largely because injuries from collisions etc. do not spread so extensively. As regards convenience in manufacture, steel is easier to work when cold than iron, and can be cast or rolled in larger sizes, for many parts of the ship. Both these materials enable a machine to manufacture and substitute *one* piece in many portions of the ship, where, in a wooden vessel, the carpenter must carefully fit together many pieces. The single disadvantage of the metal ship is its greater tendency to become covered with sea weed etc.— that is, to "foul." In consequence it must resort much more often to the docks for cleaning.

Shipbuilding once was a trade and an art. It now is an *industry* in which many trades are combined, from boiler-making to electric-wiring and from the calculation of the strains to which the several parts will be submitted to the decoration of the splendid furniture of the finished ocean-liner. Again, it is a *science* rather than an art, inasmuch as the builder is guided, not so much by the image and the actual sight of the ship, as by a system of rules and by pages of calculations.

The best ships are built double-bottomed. The keel is laid, and then the bottom is built of a number of cells or steel-boxes. One or more longitudinal bulkheads run the length of the ship. Steel frames take the place of the old wooden ribs, and are so shaped as to connect readily with the other parts of the ship. Plates of the required sizes and shapes are then brought, riveted and calked. The rivets are brought red-hot, placed through holes bored in the plates, and then hammered out so as to stay. As they cool, their grip fastens. Calking is done by hammering a chisel-shaped tool against one plate where it overlaps the next one. The great length of our modern ships is made possible by a truss-construction, not unlike that employed in many steel-bridges. The best ships are divided into many watertight compartments, such that two or more may be filled without causing the ship to sink. These compartments naturally add still more to the strength of the ship. It is common to use the double-bottom to admit water as ballast, where the ship has a light cargo. In simpler ships the frame or rib joins directly to the keel.

Vessels are usually launched when the hull is sufficiently advanced to assure its floating, so as to diminish the weight to be handled in launching. A cradle is commonly built around the ship, which is of wood, and rests on smooth, wooden "ways" which are lubricated with soap etc. These support the vessel beneath and at the sides. The keel rests on blocks, which also support the ship out towards the sides. When these blocks are knocked away, the weight of the ship is transferred to the cradle and to the ways. As these have a slope of about five eighths of an inch to a foot and are well-greased, the ship has only to be released from restraint to start with increasing velocity towards the water. It is at the moment when the restraints have been removed, after the blocks have been knocked away that the ceremony of "christening" the ship commonly takes place. Once the vessel is afloat, the machinery and, if it is a warship, the armament are put in, and the furnishings of the ship are completed. In the case of a modern ocean-liner the rooms are decorated as in the richest hotels.

Many enormous cargo-ships have been built, of which *The Oceanic* of 28,000 tons is an example. These ships have steam or electrical hoisting-engines on their decks, and the masts serve as derricks in port and as signal-posts at sea. Sails they never bear. Oil is shipped in tank-steamers, and wheat-ships have special forms of construction to make the unloading and loading easier.

Most large vessels are now built with two and even more screws. This enables the

ship to proceed if one shaft breaks and also to steer with the screws if the steering-gear is broken. The latest improvement in propelling is the use of turbine-engines. In the regular engine there is a backward-and-forward motion of the crank of the engine, which is called a reciprocating engine. In the turbine the steam enters a huge, hollow wheel, and, striking many obstructions in it, imparts a rotary or circular motion to the wheel before it leaves the wheel. The motion of the wheel is so swift that it is not economical to use turbines on any but the faster vessels. A disadvantage of their use is that no way has been found to reverse the turbine, for a ship sometimes has great need to reverse quickly in order to avoid collisions etc. Turbines are now employed in many European vessels, but are not yet in common use in America.

The *Lusitania*, sent to the bottom in 1915 by a German torpedo, was one of the best steamships afloat. Its power was furnished by six turbines, four to drive the ship ahead and two to reverse her motion in case of need. Ordinarily the two latter lay idle. She therefore had four propellers at the stern. Other vessels, larger than the *Lusitania*, are the *Vaterland*, with a tonnage of 54,282, 920 feet long by 100 feet broad; the *Imperator*, tonnage 52,000, 898 feet long by 97 feet broad; the *Europa*, tonnage 50,000, length 911 and width 96. The foregoing gives some idea of the size and construction of modern steamships. Larger and better vessels are continually being built. *The Mauretania* is the same size as the Lusitania was, but is apparently a little slower. The ships are fitted with platforms for six-inch guns, and in time of war can be converted readily into cruisers. See NAVY, SHIP, STEAMSHIP and TURBINE.

Shi'ras, George, American jurist and associate-justice of the United States supreme court, was born at Pittsburgh, Pa., Jan. 26, 1832, and educated at Ohio University, Athens, O. He subsequently graduated at Yale, studied law there, and was admitted to the bar in his native city, where he practiced with success until 1892, when he was appointed to succeed Judge Bradley as associate-justice of the supreme court. He retired Feb. 24, 1903.

Shi'ras, George, born Jan. 1, 1859, son of the above, lawyer and republican congressman from Pennsylvania from 1903 to 1905. He is also a writer of considerable note on biological subjects and legal questions, as well as a very successful amateur photographer of wild animals. He fathered considerable legislation for the protection and preservation of our birds.

Shiraz (*shē'răz*), a city of Persia, celebrated in Persian poetry for its climate, wine, roses and beautiful gardens, is on a broad plain, 35 miles southwest of ancient Persepolis and 217 southeast of Ispahan. The walls are about four miles around, and there were many fine mosques and other buildings until the earthquakes of 1812 and 1824, which destroyed large parts of the city and 4,000 of its inhabitants. An earthquake in 1853 completed the destruction of the city and killed 10,000 people. The city has been rebuilt, and its wine, which resembles Tokay, is still famous. Rosewater is made in large quantities, and very fine inlaid work is produced. The city was a favorite resort of the Persian princes and was the home of Hafiz and Sádi, the poets, whose tombs are in the neighborhood. Population 50,000.

Shishak (*shī'shăk*), the name of several kings of Egypt belonging to the 22d or Bubastite dynasty (10th century B. C.). The name of Shishak or Sheshonk I is found on the porch of the great temple of Karnak and on several statues of a goddess, which probably came from Luxor. Jereboam, it is recorded in *Kings*, fled to Shishak when Solomon wished to kill him, and on his return became king of the new kingdom of Israel, which was formed by the ten tribes revolting from Rehoboam. Shishak marched against Rehoboam in the fifth year of his reign, and took Jerusalem and the treasures of the temple. This conquest of Jerusalem is recorded on the monuments of Karnak, where Shishak is represented as dragging before his god, Ammon, three rows of prisoners, marked with the names of such places as Judæa, Megiddo and Ajalon.

Shoe'mak'ing is an industry which probably was introduced into the United States by Thomas Beard on the third voyage of *The Mayflower*. Shoes were made entirely by hand until the introduction of a nailing and lasting machine by M. J. Brunel, an Englishman, in 1810. By 1850 the parts of shoemaking had become divided among sets of workmen, so that one set did the cutting, another the sewing, and yet another the lasting, pegging and trimming. But in 1850 the leather began to be rolled by machinery; and in 1860 the McKay sewing-machine was introduced for sewing together the soles and the uppers. At present the fastening is done by means of a welt, a strip of leather sown to the upper and bent over the sole of the shoe. The making of shoes at present calls for little hand-work, except that in the case of the best soles the leather is often cut for the uppers by hand for the sake of ensuring the flawlessness and uniformity of the piece. The leather is pared by a machine, rolled solid by a machine, often cut by a machine, stitched by a sewing-machine (often by several, one for each seam), and often lasted, soled and heeled by a machine. The soles of course are always cut separately from the uppers; and the heels are usually cut and built up separately by a machine before they are fastened to the

shoe. Finally a machine is used for trimming and polishing. In the United States about $120,000,000 is invested in the manufacture of shoes; and the annual output is probably worth $300,000,000. Yet these figures represent only about 1,600 great shoe-factories.

Shoot. In the higher plants the main axis of the body grows in two directions. In general, that part of it which grows downward is the root and that which grows upward is the shoot. In ferns and seed-plants the shoot for the most part is differentiated into stem (often with branches) and leaves. In ordinary liverworts (as *Marchantia*) and in the sporophyte of mosses the shoot is not so differentiated.

Short'hand or **Phonog'raphy** is a mode of writing which has been invented to enable one to write as rapidly as a man can speak. The first system appeared in 1588, and nearly 200 different systems have been developed and published. Sir Isaac Pitman's (*q. v.*) system, called phonography, was published in 1837 and is largely used, though some improvements have been made in it. It has been adapted to the Japanese, French, Italian, German, Dutch, Spanish, Hindu and Malagasi languages. It is based on the use of characters to represent the sounds instead of the letters of the English language. The characters used, curves, lines, dashes, etc., also stand not only for a sound but for words which occur very frequently, as the, and, it, etc., called letter-words or grammalogues. The marks also indicate the vowels by their position on, above or below the line. By the use of shorthand a reporter writes 200 words a minute. Average speed is 120.

Short Ballot. A feature of modern electoral reform is the "Short Ballot," under which only the more important public offices are filled by election, other offices being filled by appointment, the officials thus chosen being held responsible for the conduct of those whom they appoint. Many states have direct primary laws under which candidates are nominated directly by the people. Under this system the names of all candidates whose petitions are signed by a certain percentage of the party voters are placed on the ballot. The primaries are conducted by the regular election officials at the usual polling places and at the public expense.

Shoshone (*shō-shō'nē*) **Falls,** a cataract on Snake River in southern Idaho. The river runs through a deep gorge between walls of rock 1,000 feet high. The head of the falls is in the shape of a semicircle, from which the water leaps 210 feet in a sheet 950 feet wide. Niagara falls less than 170 feet. Little Shoshone Falls are two cataracts separated by a great rock, with a fall of 182 feet, about four miles higher up the river.

Shoshones or **Snakes,** a family of American Indians, which includes the Utes, Comanches and several other tribes. They have been known by various names, as Buffalo-Eaters, Sheep-Eaters and White Knives. They were found by Lewis and Clark beyond the Rocky Mountains in 1805. Their homes were in the valleys of Snake River, Humboldt River and Great Salt Lake. They have usually been peaceful, having little intercourse with the whites. From 1849 to 1862 there were battles and skirmishes with the advancing settlers, treaties made and broken by the government, until in 1867 they made peace at Fort Bridger and were settled on reservations in Idaho, Wyoming, Nevada and Utah. They number about 6,000.

Shot is the name given to all solid projectiles, *i. e.*, anything thrown out or fired from any kind of firearms. The shot used for cannon and machine-guns are made of cast iron or steel and formerly were solid balls. Balls weighing more than three pounds are not now made solid. Bar-shot were two discs of iron joined by a bar, used to destroy the rigging of a ship; chain-shot, used in the same way, were two round shot fastened together by a chain. Canister or case-shot is a tin cylinder filled with bullets. Grape-shot was a number of small, iron balls held together by canvas or iron plates, but is no longer used. Small shot, used in hunting, is made of lead in various sizes, from that of large peas to dust-shot. The melted lead is dropped from a height through a colander into water. The lead falls in small drops through the holes of the colander, the shot varying with the size of the holes. The fall through the air cools and hardens the lead before it falls into the water. Shot-towers are from 100 feet to 150 feet high; the highest shot-tower is in Austria and is 249 feet high. The shot is sifted in sieves to separate the different sizes, imperfect ones being discovered by rolling them down an inclined plank, and is finally polished. See CANNON, PROJECTILES and SHELL.

Shotgun. A light, smooth-bored gun for sporting purposes, in contradistinction from the military rifle. It is especially designed for firing a number of small shot at short range to kill small game. Shotguns formerly were double-barreled, but now more commonly obtain rapid fire by means of a revolving cylinder or other device. The present perfection in the mechanism and efficiency of the shotgun is due to many inventions in France, England and America. For a long time the best were of English manufacture, but it is now generally conceded that the American weapons have preëminence. See ARMS, GUN and RIFLE.

Showers of Fishes, a curious phenomenon most common in tropical regions. It is explained by a strong draft upward in

the center of a whirling column of air, which sucks up the fish from the water and carries them through the air, dropping them at some distance from their homes. On the Isle of Mull herrings fell on a hill 1,500 feet from the sea and 500 feet above it. Sometimes the fishes are alive, but more often they are dead. Showers of frogs and of dead flies have also been noted.

Shreve'port, parish seat of Caddo Parish, La., 170 miles east of Dallas, is at the head of navigation on the Red River. Eleven railway lines run into it, and it is surrounded by a region rich in gas and oil that also produces cotton, lumber, and live stock. Shreveport is the largest fertilizer center west of the Mississippi and has one of the largest Building and Loan associations in the South, as well as a big wholesale trade. The city is governed by a commission council of four. It was settled in 1833, and incorporated in 1839. Population, 41,133.

Shrew, an insect-eating animal having the general appearance of a mouse, but belonging to quite a different order. The mice are gnawers, the shrews are insect-eaters and related to the moles. They have a sharp, pointed snout and jaws with numerous, sharp teeth. The eyes and ears are minute. They come out occasionally from their burrows, but seem very helpless above ground, and are exceedingly shy. They feed both day and night. They do not burrow deeply, their holes being under roots and in logs. They inhabit the Old and New Worlds, living in fields and open woods. Besides insects they eat worms and mollusks. Water-shrews exist also in North America and in Europe.

COMMON SHREW

Shrike, a song-bird found in all parts of the world except South America. Shrikes, besides eating insects, prey upon field-mice and small birds, capturing them with their bills and not with their talons. Owing to the weakness of their feet, their prey is impaled on thorns, and this habit has gained for shrikes the name of butcher-birds. There are about 200 species, but only two in the United States. The great northern shrike, which is a winter visitor, is a little above ten inches long, gray above with a black and white tail and whitish undersurface with black bars. It nests in the arctic circle, but is seen from October to April as far south as Virginia. The loggerhead shrike is common in the Mississippi valley, central New York, Vermont and Maine. It is about nine inches long and colored like the great northern shrike, except that there are no black bars on the breast. Its song is rather unmusical.

SHRIKE

Shrimp, small, slender and long-tailed crustacea inhabiting salt water. The prawns are closely related and are commonly served in shrimp-salad. These animals are all small, in general form resembling a lobster or crayfish. Some are nearly transparent. They live on the sand in salt water. They are taken in great numbers for food, especially in England and in France.

SHRIMP

Siam (*sī-ăm'*), **Gulf of,** an arm of the China Sea, south of Siam and west of Cochin-China. It is 245 miles wide at its entrance, and extends inland for 390 miles.

Siam, Kingdom of, in the Indo-Chinese peninsula, is a country whose limits have varied much at different periods of its history, most of the border-lands being occupied by tribes more or less independent. By the treaty of September, 1893, Mekong River was made the boundary between Siam and the French possessions; but in January, 1896, the British and French governments came to an agreement by which France appropriated the territory of 100,000 square miles lying between the Mekong and the Anam hills, thus leaving to Siam a territory of 220,000 square miles. Negotiations have been in progress recently for a new British-Siamese treaty, which will modify British extraterritorial rights in Siam and cede the Siamese tributary states of Kelartan and Tringaur to Great Britain.

Surface and Drainage. The plain of the Menam valley and the Korat tableland, from 400 to 1,000 feet high, form the larger part of the country. The Menam, 600 miles long, is the principal river, but the bar at its mouth prevents ships of more than 13 feet draught from ascending to Bangkok. Mekhong or Cambodia River

is partly within the territory, but is of little use for navigation, being obstructed by falls and rapids. Many canals have been cut, for transportation has been almost entirely by water.

Natural Resources. Gold has been found from the earliest ages, and the mines are now worked by European speculators; copper, tin, iron, rubies and sapphires are also found. Much of upper Siam is a dense forest, including such woods as mangosteen, teak, rosewood, palms, aloes, sappan and other varieties. The fisheries also are quite extensive, and birds of brilliant plumage and sweet song abound. The animals are those of the tropical regions, the elephant being tamed and used for labor in the teak forests. Some of the famous white elephants are kept in the royal courtyard at Bangkok, but are not held sacred or fed on golden dishes, as the stories assert. The climate is healthy, with two seasons, the wet and the dry, and a rainfall of 54 inches. April is the hottest month of the year.

People and Culture. The population numbers 6,686,846, about one third of whom are pure Siamese. There are 3,500,000 Chinese, besides Burmese, Malays, Cambodians and the Laos or Shans. The Siamese are small, well-shaped, olive-colored, black-haired. They are peaceful, vain, social and lazy, fond of bright colors and jewelry. The children's heads are shaved, except a tuft on the crown, which is cut off with great ceremony when they are grown. Their houses are built of wood thatched with palm leaves, and stand on piles. The banks of the rivers are often lined with wooden houses floating on rafts or bundles of bamboo. The food mainly is rice, fish and fruit. A liquor made from rice is used as a drink, but there is very little drunkenness. Betelnut-chewing and tobacco-smoking are almost universal, the teeth being colored black by the nut and other materials used for the purpose. The religion is Buddhism, and all the Siamese enter the priesthood for a time. The temples are numerous, with gilded minarets, roofs of colored tiles and quaint pagodas.

Production and Industries. Large tracts of waste land, sufficient to accommodate 250,000 people, have been opened by irrigation. One irrigation-company has connected Menam and Bangkapong Rivers and is building numerous smaller canals. Chinese coolies perform the chief part of the labor in field, mill and mine, while forest-labor is done by Burmese, Karens and Khamus. The chief product is rice, with tobacco, coffee, hemp, cotton and tropical fruits. There are 26 large rice-mills and a number of smaller ones. Other products include salt, pepper, dried fish and cattle. Rubber is collected and exported. Teak-cutting also is an important industry, but it is almost entirely in the hands of the British. Manufactures are not developed; only coarse cloth and silk, rough paper and water-jars and tiles are made.

Government. Siam is governed by a king, the present ruler being Chulalongkorn I, who succeeded in 1868. He is anxious to improve his country, and is interested in the introduction of railroads and telegraph lines. Through his influence Siam joined the postal union in 1885, and has an electric-light company to light the streets of Bangkok, which also has electric cars, while education is making distinct progress. In the capital alone there are nearly 80 government and aided schools, and these, with the schools in the provinces, are under the control of an English chief-inspector. There are two training-schools for teachers, one medical college and sericultural and railway schools. The government has spent $5,000,000 on 400 miles of railway construction, telegraph lines have been completed 2,900 miles, and mail-service down the Malay Peninsula has been developed extensively.

History. Siamese history begins with 1350. Cambodia was conquered and made tributary in 1532, and the present dynasty was founded in 1782. Ayuthia was the capital until it was burnt by the Burmese after a siege of two years in 1768. Bangkok (population about 500,000) was made the capital by Phya Tak, who drove the Burmese from the country and became king. Consult Coit's *Siam*; Hallett's *Thousand Miles on an Elephant;* and Vincent's *Land of the White Elephant.* See ANAM, CAMBODIA, COCHIN-CHINA, INDO-CHINA, LAOS and SHANS.

Si'amese' Twins, the name of two children, Eng and Chang, born in Siam in 1811. They were united by a band of flesh growing from chest to chest. They were shown as curiosities in the principal cities of Europe and America, and finally settled in North Carolina, where they married two sisters. The Civil War ruined them financially, and they again made the tour of Europe, exhibiting themselves in 1869. They died in North Carolina, two hours and a half apart, Jan. 17, 1874.

Siberia (*sī-bē'rĭ-a*), a vast territory belonging to Russia in northern Asia. It covers 4,786,730 square miles, stretching from the Chinese empire to the Arctic Ocean.

Surface. A large part is only imperfectly known. It is covered with a network of highlands and mountain-ridges, of which the Great Altai and Sayan Mountains, separating Siberia from Mongolia; the Barguzin and South Muya ridges, with others still unnamed; and the Stanovoi Mountains, which form a high wall on the coast of the Sea of Okhotsk, are the most

important. Some of the peaks of the Altai Mountains and a few others rise into the region of perpetual snow. A belt of forests on the northwestern border of the central plain and, beyond that, another belt of high plains 500 miles wide, 1,700 to 2,500 feet high and most of it very fertile, end in an immense lowland stretching to the shores of the Arctic Ocean. These lands in western Siberia are very fertile, are the granary of Siberia, and contain one third of the population. Between Obi and Irtish Rivers are great marshes, which can be crossed only when frozen; and, farther north still, come the *tundras* (salt prairies and frozen swamps), where the ground is frozen hundreds of feet deep and thaws only on its surface in the summer. Trees disappear, only a few low bushes and a few flowering plants surviving the cold. Yet 50,000 human beings call this region home, and wander over it with sledges drawn by reindeer and dogs. In southeastern Siberia, in the Amur province, are high plains, covered with oak forests and rapidly filling with emigrants from Russia; while there are fertile tracts on the frontier of Korea and a splendid harbor at Vladivostok on Peter the Great Gulf.

Drainage and Climate. Great rivers — the Obi, Yenisei, Irtish, Lena and Amur, being some of them — greatly assist internal communication in this great country, and four lines of railroad have already entered Siberia on the west, one of which, the trans-Siberian line (*q. v.*) opened in 1899, established uninterrupted steam-communication through the Russian empire. Siberia is the coldest country in the world. Yet the summers are much warmer than is usually supposed; melons grow in the open air in some parts, and barley sown in May will ripen by August. The summers, however, are short, and by November all the rivers are frozen, and in the extreme north the thermometer has recorded 75° below zero. The air is very dry and there is no wind, which makes the cold more endurable.

Inhabitants. Siberia had a population of 8,220,100, January 1, 1910, according to the Russian Statistical Committee. These figures include native Siberians, Koreans, Manchurians, Chinese and about 90,000 Russian immigrants each year. The Russians belong to the Greek church; the Turkish tribes are Mohammedans; while others are Buddhists.

Natural Resources. Siberia is rich in minerals, but mining is undeveloped; gold, silver, lead, copper and iron are mined, however, in considerable quantities, a profitable trade in timber is carried on, and the coal-mines yield over five million tons annually.

Occupations. The chief occupations are farming and cattle-breeding. In a single year 11 million acres were in meadow-land, 9,773,000 in cereal crops and 171,000 in potatoes. The wheat-crop in 1910 was 45,000,000 bushels; the oat-crop of Asiatic Russia 79,743,000 bushels, the larger part coming from Siberia. The live-stock industry is quite valuable, and horses, cattle, sheep and pigs are raised in considerable numbers. Hunting is profitable for the valuable furs of the sable, ermine, gray and white foxes; and fishing is carried on extensively.

Manufactures. Government factories are operated in some of the larger towns, and porcelain, hardware, leather and earthenware are among the products. Extensive woolen and linen factories are among the industries. In Asiatic Russia there are 8,005 miles of railroad. There are 339 schools, supported in the main by local authorities, with 773 teachers and 43,786 pupils.

History. The earliest inhabitants are by some writers called Yeniseians, who were followed by a race of considerable skill, judging from their relics found in mounds. Turks conquered the country in the 11th century, and were themselves conquered by the Mongols two centuries later. Russians first invaded the region in 1580, by a band of Cossack robbers, followed for two centuries by other bands of Cossacks, traders, hunters, dissenters flying from religious persecution and peasants escaping from serfdom. In the first 80 years the Cossacks had reached the Sea of Okhotsk, but Russia's possession was not acknowledged by China before 1857. Bering Strait was discovered in 1648 by Dejnef, the Cossack, who sailed around the northeastern end of Asia; but, as his discovery was not made known, the honor still belongs to Bering. Consult Lansdell's *Through Siberia;* Kennan's *Tent-Life* and *Siberia and the Exile System;* and Dewindt's *The New Siberia.*

Sibe'rian Railroad. The building of this road was begun in 1891 and was completed in its main features in 11 years, including a branch across Manchuria to Port Arthur and Dalny. It starts from Tchelyabinsk on the eastern slope of the Urals, and extends to Vladivostok on the Pacific, a distance of 4,500 miles, following the fiftieth parallel. This is the main division of the railroad. The great Russian system which connects Petrograd, Port Arthur and Vladivostok measures 6,672 miles. The first work on the real road was done on May 1, 1891. In perfecting the enterprise Russia sent commissioners to the United States to study American railroad-systems; imported Italian workmen who had helped to build the Simplon and St. Gothard tunnels; built towns in deserts; and transported whole families by the thousands to them for their work. Many serious obstacles had to be overcome far from the base of sup-

plies. Lake Baikal was a great barrier; steamers transported the cars in summer, and ice-breaking steamers were used for a part of the long winter. The line was completed, however, by the building of a 100-mile detour around the southern end of the lake in 1904. The road was built cheaply, with light rails and wooden bridges, but, when formally opened in 1902, had cost $172,525,000. It has proved a good investment, having given an impetus to agriculture and all other business of Siberia. Branches from the main line are projected, chiefly to the northern portion of Asiatic Russia. In 1906, by Russian official statistics, this road carried 162,000,000 pounds of freight and 2,097,000 passengers. Great quantities of wheat and tea are carried, the tea being brought by caravan from China. This line is of great military and political importance. In 1904 Russia dispatched over 300,000 troops over it in 90 days, with enormous quantities of provisions and supplies.

Sibyl (*sĭb'ĭl*), a name given to certain inspired prophetesses in the classic period. Their number varies, but is generally fixed at ten, of whom the most celebrated was the Cumæan, who is mentioned, in the sixth book of the *Æneid* as leading Vergil into the lower world. According to Livy she came from the east to King Tarquin, offering nine books of prophecies but at so enormous a price that he refused to buy. She then destroyed three, and, returning, offered the remaining six at the same price, and was again refused; destroying still another three, she asked as much for the three left, which Tarquin's curiosity finally induced him to buy. They contained advice regarding the religion and government of the Romans, and were carefully guarded in the temple of Jupiter until 83 B. C., when the temple was burned. A new collection was made of about 1,000 lines, gathered from all the cities of Greece, Italy and Asia Minor, which was kept until some time between A. D. 404 and 408, when it was publicly burned. The Sibylline oracles written in Greek, in 14 books containing 4,000 lines, are entirely distinct, being a series of pretended predictions written by Alexandrine Jews and Christians.

Sicil'ian Ves'pers, the name given to the massacre of the French in Sicily, March 30, 1282, the first stroke of the vesper-bell being the signal for slaughter. Charles of Anjou, brother of Louis IX of France, had conquered Naples and Sicily, but was hated by his Sicilian subjects for his cruelty and injustice. The inhabitants of Palermo at that signal rose against their French oppressors, killing men, women and children to the number of 8,000, an example followed throughout the island, where the French were hunted like wild beasts. The 600th anniversary of the Sicilian Vespers was celebrated in 1882. Consult Amari's *War of the Sicilian Vespers*, translated by the earl of Ellesmere.

Sic'ily, the largest island in the Mediterranean, is the most populous and the most fertile. It lies off Italy, separated by the Strait of Messina, two miles wide.

Area and Surface. It covers 9,935 square miles and is shaped like a triangle. Sicily is a plain, 500 to 1,900 feet above the sea, crossed in the northern part by a chain of mountains, the loftiest peak being 6,467 feet high. From the center of the chain a range branches off, going through the heart of the island to the southeast. The lower mountain-slopes are usually covered with groves of oranges and olives, and the plain with fields of wheat. Mt. Etna rises from the vineclad plain of Catania, 10,850 feet, with a base of 400 square miles. The climate is warm except in the mountain-regions.

Natural Resources. Magnificent forests of oak, ilex, beeches, chestnuts and pine are still found, though many have been recklessly destroyed. Dates, figs, almonds, lemons, olives, pomegranates and grapes are very abundant. The wheat of Sicily is one seventh that of all Italy, and the barley one half of the crop of the kingdom. The only mineral product is sulphur, of which there are some 300 mines. Sardine-fisheries employ a large number of persons.

Industry. It manufactures two thirds of the wine of Italy, and exports a large amount of sumac for tanning. Manufactures, however, are few — mainly cement, crockery, gloves, macaroni, soap, some silk, cotton, woolen and linen goods; glass, oilcloths and leather are produced. Rapid progress is being made in railroad-building, and 500 miles are in operation.

People. The population numbers 3,683,380. The people are devout but superstitious, and three fourths of them cannot read. Elementary education is compulsory, however, for children between six and nine; and, though this law is by no means strictly enforced, school-attendance is steadily increasing.

History. There were early Phœnician settlements, but the real settlers were Greek colonists who founded cities on the eastern and southern coasts from 735 to 579 B. C. The first struggle with Carthage, which ended for 70 years by the great victory at Himera over Hamilcar in 480, was followed by a Phoenician invasion under Hannibal (not the great Hannibal), but Dionysius the Tyrant checked the Carthaginian conquests. In 210 B. C. the island became a Roman province. It was conquered by the Vandals in 440 A. D., ceded to Theodoric, and regained by Belisarius (535). The Saracen occupation, dating from 827, lasted until the Normans took possession in struggles lasting from 1038 to 1090. The Norman,

Roger, Count of Sicily, in 1130 took the title of King of Sicily and Italy. In 1194 the crown went by marriage to the German emperor until 1264, when Pope Urban IV, a Frenchman, gave Sicily to Charles, Count of Anjou. Manfred, the last native ruler, died fighting against the invader, and his son-in-law, Peter of Aragon, continued the contest, ending with the crowning of his son, Frederick, in 1296. The contests of France and Spain for Sicily and Italy continued, and in 1502 Ferdinand of Aragon defeated the French at Mola and became king of Naples and Sicily. The peace of Utrecht (1713) gave Sicily to the duke of Savoy, who in 1720 exchanged it with Charles VI of Austria for Sardinia, but in 1738 Don Carlos of Spain was king of the Two Sicilies. The Bonaparte rule began with the taking of Naples in 1798, lasting until 1808, when Ferdinand IV was allowed to remain king of Sicily, afterwards taking by the treaty of Paris his old kingdom of the Two Sicilies. At last, on May 11, 1860, Garibaldi, with his thousand heroes, took Palermo and entered Naples in triumph, and the people by popular vote joined themselves to the Sardinian kingdom. The chief cities of Sicily are Palermo (population 309,694), Messina (149,778) and Catania (149,295).

THE TWO SICILIES, a kingdom of southern Italy, included Sicily, several smaller islands and the kingdom of Naples. Consult E. A. Freeman's *History of Sicily*; his shorter history in the Story of the Nations Series; and Frances Elliot's *Diary of an Idle Woman*.

Sick'les, Daniel Edgar, an American general, was born at New York, Oct. 20, 1825. In 1847 he was sent to the legislature, and in 1853 went to England as secretary of legation, and in 1856 became a member of Congress. When the Civil War broke out, he was made colonel of a regiment he had raised in New York, and as brigadier-general commanded in the battles of Chickahominy. At Antietam and Fredericksburg he commanded Hooker's division of the 3d corps, and with the rank of major-general served at the head of the 3d corps at the battles of Chancellorsville and Gettysburg. After the war he was commander of the military district of North and South Carolina until 1867, and in 1869 was appointed minister to Spain. In 1892 he was elected to Congress from New York City.

GENERAL SICKLES

Sidd'ons, Sarah (Kemble), the great tragic actress of England, was born at Brecon, Wales, July 5, 1755. Her father was the manager of a small, traveling, theatrical company, and she took part in the performances from earliest childhood, and at 17 married Siddons, a member of the company. Her first appearance at Drury Lane, Dec. 29, 1775, in the character of Portia was a failure, and for six years her acting was confined to the provinces. In 1782 she reappeared in London as Isabella in *The Fatal Marriage*, and was the queen of the English stage from that time until, as Lady Macbeth, she took leave of it, June 29, 1812. She gave public readings from Shakespeare and Milton, and appeared occasionally for charitable objects after leaving the stage. She died at London, June 8, 1831. See *Life*, by Mrs. Kennard, in the Eminent Women Series.

Sid'ney, Sir Philip, an English courtier and writer, was born on Nov. 29, 1554, at Penshurst in Kent. He studied at Oxford, finishing his education, after the fashion of the day, by travel in France, Germany and Italy. Leicester, his uncle, being all-powerful at the court of Elizabeth, Sidney at once began his public life. He was sent as ambassador to Rudolph II of Austria and then to William, Prince of Orange. At first a favorite of the queen, he lost her influence by his defense of his father against her ingratitude and by his opposition to her proposed marriage with the Duke of Anjou. In 1580 he retired from court, living with Lady Pembroke, his sister, where he probably wrote his *Arcadia*. His associations with Spenser and perhaps the circulation of his writings in manuscript had already given him a wide reputation, which was well-sustained by *Arcadia*, written in 1578–80, which appeared in 1590 and for a century retained its great popularity. It is a pastoral romance written in poetical prose. Though not free from the "conceits" of the age, still is well-worth reading. His *Apology for Poetry* (*Defense of Poesy*), written about 1580, displays vast reading, and, while criticising severely the crowd of common versifiers, names as the best English poets Chaucer, Sackville, Surrey and his friend, Spenser. His own poems, *Astrophel and Stella*, a series of 108 sonnets and 11 songs, were inspired by his love for Penelope, a daughter of Lord Essex, and place him near Chaucer. He returned to court, was knighted, and in 1583 received from Elizabeth a grant of 30,000,000 acres in "certain parts of America not yet discovered," and planned to accompany Drake to America. He was ordered, however, to go with Leicester to the Netherlands, where, after a brilliant exploit in a chivalrous conflict, he was fatally wounded under the walls of Zutphen, Oct. 2, 1586. Faint from the loss of blood, he called for a drink, but, seeing a poor soldier carried by, looking longingly at the water, he handed the

cup to him, saying: "Thy necessity is greater than mine." See *Life* by Symonds in the English Men of Letters Series.

Si'don, an ancient city of Phœnicia, on the eastern coast of the Mediterranean, about half-way between Tyre and Beirut. It held the first position among the cities of Phœnicia, so that it sometimes gave its name to the whole region. Its colonies were found throughout the ancient world, and its commerce was very large. Its manufactures of linen, glass, purple dyes and perfumes were sources of great wealth. Even under Assyrian, Chaldean and Persian rule it retained its importance, reaching its highest prosperity under the Persians. An unsuccessful revolt in 351 B. C. involved it in temporary ruin, from which it recovered speedily. In 333 B. C. Alexander the Great conquered it, and it fell in succession into the hands of Syrians, Greeks and Romans, and in the middle ages was taken by crusaders. The present town, called Saida, has 10,500 inhabitants.

Siemens (*sē'mĕnz*), **Ernst Werner von,** a German electrician, was born at Hannover, Dec. 13, 1816. In 1831 he took out his first patent for galvanic silver and gold plating. His work in connection with the telegraphic system of Prussia resulted in the discovery of the powers of gutta-percha in insulating underground and marine cables. He is known as one of the discoverers of the self-acting dynamo. With his brothers he established large houses for the making of electrical apparatus in Berlin, St. Petersburg, London, Vienna, Tiflis and, in 1892, in Chicago. His scientific papers were collected and published in 1881. He was one of the foremost electricians of the day, sharing with his brothers in many inventions. He died at Berlin, Dec. 6, 1892.

Siemens, Sir **William,** the German scientist, was born near Hannover, April 4, 1823. He studied at Göttingen, giving special attention to science. After two visits to England in the interests of his brother's inventions, he made England his home in 1844 and became a British subject in 1859. As manager of the house of Siemens Brothers, he was engaged in constructing telegraph-lines, the steamship *Faraday* being designed by him for cable-laying. He also built electric railroads. The principle of his "regenerative" furnace has been applied in many ways, but especially by himself in the manufacture of steel. He invented a water-meter, a bathometer for measuring ocean-depths, an electrical thermometer and a process of hastening the growth of plants by electric light. In 1874 the royal Albert medal and in 1875 the Bessemer medal were given him in recognition of his inventions. He was president of the three principal telegraphic societies of Great Britain and of the British Association, and in 1883 was knighted. He died at London, Nov. 19, 1883. See *Life* by Pole.

Siena (*sē-ā'nȧ*), a city of Italy in the center of Tuscany, about 60 miles south of Florence. It is a walled city, with narrow, winding streets. The cathedral, begun in the 13th century, is one of the finest Gothic churches in Italy, with a wonderful eight-sided pulpit, a fine mosaic-floor, a series of frescos of scenes in the life of Pope Pius II and a font with bas-reliefs by Donatello and other sculptors. The church of St. Catherine, the fountain of Fontebranda, celebrated by Dante, the palace and its high tower, the university, founded in 1300, and the Institute of Fine Arts are among the attractions. There are manufactures of silk, cloth and hats and a trade in wine and olive-oil. Siena, a Roman colony, became a free republic at the breaking up of the empire, and was the head of the Ghibelline towns in central Italy, being a rival of Florence. In 1399, to protect themselves from Florence, the Sienese placed themselves under the duke of Milan, and in 1524, to escape the usurpations of the Petrucci family, they became tributary to Emperor Charles V, who afterwards gave Siena to Cosmo de Medici, and it became a part of Tuscany. It is the seat of a university with 31 professors and 231 students. Population 41,659.

Sienkiewicz (*shĕn-kyĕ'vĭch*), **Henryk,** Polish novelist, was born at Wola Okrzejska, in Lithuania, in 1846, and was educated at the University of Warsaw. Early in his career, having espoused journalism, he devoted himself to literature, and soon won a high position as a novelist and short-story writer. In 1876 he came to the United States, and for a time, in company with Madame Modjeska, his countrywoman, he resided in California, where he designed to establish a Polish colony. In 1880 he wrote *Tartar Slavery,* following this, a few years later, by his masterly novel, *With Fire and Sword.* To this succeeded *The Deluge, Pan Michael, Without Dogma, Children of the Soil, The Knights of the Cross* and *On the Field of Glory* — all remarkable for vigor of characterization, historical truth and power of psychological analysis. In 1895 appeared his masterpiece, *Quo Vadis?* — a tale of the time of Nero (*q. v.*), written with remarkable vigor and powerful effect. He died in 1916.

Sierra Leone (*sĭ-ĕr'rȧ lē-ō'nē*), a British colony on the western coast of Africa, founded in 1807 and southeast of French Guinea. It lies north of Liberia, with 180 miles of coast, and, stretching toward the interior, covers about 4,000 square miles. The name is sometimes confined to the peninsula south of Sierra Leone Inlet, which is 26 miles long, rising to 3,000 feet in Sugar-

Loaf Mountain. The climate is hot and moist, and the lowlands malarious, giving it the name of the White Man's Grave. The people, numbering 76,655, are nearly all negroes, the white population numbering only 350. Agriculture and trading occupy about one fifth of the population, but the resources are not fully developed. Coffee, cocoa, tapioca, ginger, maize and cotton are grown, and there are a little boat-building, mat-making and cloth-weaving. The chief exports are kola-nuts, palm-oil and nuts and rubber; the chief imports, cotton-goods, tobacco and spirits. Freetown, the capital, the most important seaport in West Africa, is a fortified naval depot and a coaling-station. There are a university, founded by the Church Missionary Society, a savings-bank, a lunatic asylum and 65 schools, with an average attendance of 5,583 pupils. Sierra Leone (Lion Mountain) was discovered by Cintra, a Portuguese navigator, in 1462, and named from the heavy thunder roaring on its mountains. Attempts were made to colonize it with freed slaves in 1787 and 1791; the second effort being made under the Sierra Leone Company and supported by the arrival of 1,200 freed slaves from North America. In 1807 it was ceded by the company to the British crown. A railroad from Freetown extends 226 miles to Baiima near the Liberian frontier. Freetown has a telephone system; there are 221 miles of telegraph; and millions of dollars are being spent on railway extension and port works. The Sierra Leone protectorate, inland, covers 30,000 square miles and has nearly 1,000,000 inhabitants.

Sierra Madre (*sē-ĕr'rȧ mȧ'drȧ*), meaning Main Chain, a range of mountains in Mexico, stretching north into Arizona. The name sometimes includes the Cordilleras.

Sierra Morena (*mō-rā'nȧ*), a mountain ridge in the south of Spain, ranging from 2,000 to 5,500 feet in height. It has valuable mines of lead, silver, lignite and quicksilver; and is the scene of many of the incidents in *Don Quixote*.

Sierra Nevada (*nē-vā'dȧ*), Snowy Range, a mountain-range in southern Spain, crossing the province of Granada, about 60 miles long; Mulahacen, 11,600 feet high, is the highest point of the Spanish peninsula.

Sierra Nevada, a range of mountains in California 450 miles long, merging into the Coast Range. Mt. Whitney (14,886), Mt. Shasta (14,440) and Mt. Tyndall (14,386) are the highest peaks. The mountains are covered with forests, and gold and silver are found in large quantities.

Sierra Nevada, the name of two ranges in South America, both thought to be parts of the Andes. The mountains are wooded on the northern slopes, and naked rocks tower 6,300 feet on the southern side. Copper, silver, gold and coal are found. The highest peaks are from 15,000 to 17,500 feet high.

Sieve- (*sĭv*) **Vessels** (in plants), often called sieve-tubes, the peculiar vessels characteristic of the bast or phloem portion of the vascular bundle. They usually are more or less elongated, and the name refers to the fact that their walls contain certain areas, known as sieve-plates, which are perforated by numerous openings, like the lid of a pepper-box. The sieve-vessels are prominently associated with the transfer of food.

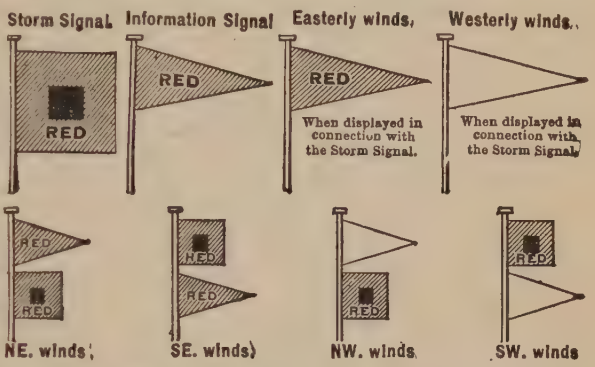
Sieyés (*sē-ā'yȧs'*), **Emanuel Joseph,** Count, known as Abbé Sieyès, a prominent figure in the French Revolution, was born at Fréjus, France, May 3, 1748. Entering the church, on account of his health, he became a canon and then chancellor and vicar-general. At the beginning of the struggles for liberty in France he published three pamphlets on political questions which made his name famous throughout France. He was elected a deputy in Paris, and it was on his motion that, when the nobles and clergy refused to join the deputies of the people, they declared themselves the National Assembly. The division of France into departments and the celebrated declaration of the Rights of Man were mainly his work. He voted for the king's death, but was opposed to a republic and to the excesses of the Revolution. Sent to Berlin, he secured the neutrality of Prussia. With Bonaparte he plotted the revolution of the 18th Brumaire (Nov. 9, 1799), ending in the consulate of Sieyès, Bonaparte and Ducos. His new ally, however, proved a master, and he resigned his consulship in disgust, though to propitiate him he was given the title of count, an estate and $120,000. He lived in Belgium during the Restoration, dying at Paris, June 20, 1836. Consult Lamartine's *History of the French Revolution*.

Sigel (*sē'gel*), **Franz,** an American general, was born in Germany in 1824. He was in the service of the grand-duke of Baden, and became minister of war in the Revolution of 1848, but was obliged to flee and came to the United States. He entered the army as colonel in 1861 during the Civil War, and by gallant service rose to the rank of major-general. He was elected registrar of New York City in 1871, and appointed United States pension-agent for the city in 1885. He died on Aug. 21, 1902.

Sigismund (*sĭj'ĭs-mŭnd*), Emperor of the Holy Roman Empire, was born on Feb. 14, 1361. When only 19, he became king of Hungary through his wife. He was terribly defeated in an expedition against the Turks at Nicopolis in 1396. Some years later he conquered Bosnia, Herzegovina and Servia. He became Emperor in 1411. His name is known by his failure to uphold

the safe-conduct he had granted to Hus, and so allowing him to be burned by his enemies. His succession to the throne of Bohemia after his brother's death was opposed by the Hussites, and he only secured it after making concessions a year before his death, which took place on Dec. 9, 1437.

Sig'naling, any means of sending intelligence to a distance by sight or sound. The earliest signals in war were by means of torches and beacon-lights. Ships depend upon a system of flags, varying in arrangement, color and shape. What is known as *The International Code of Signals*, prepared in 1857, has been adopted by nearly all nations. It uses 18 flags, with which 78,000 different signals can be given, using no more than four flags at a time. The flags are blue, red, yellow or white, and square or long and pointed, called pennants. When a square flag is uppermost, it is a danger-signal. Some of the flags are used as letters, and so spell out words. At night, red, green and white lights are used instead of the colored flags, and ships in danger fire cannon and send off rockets. In fog, mist and snow-storms vessels at anchor ring a bell; a steamer moving blows its whistle; sailing-vessels use a horn, all at least once in every two minutes. The signals and their meaning are published in the signal-book, and copies are made in the different languages of the nations using the system.



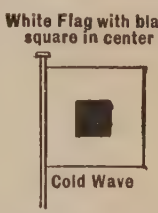
[*At night, red and white lanterns replace flags.*]

Sig'nal-Ser'vice, United States. There are three authorized systems of signaling: those of the army, of the navy and of the weather-bureau.

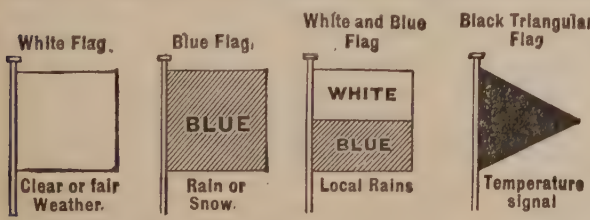
In the army the value of a thorough system was readily seen. In 1860 an appropriation was made to introduce field-signaling under the charge of an officer with the rank of major. In 1863 the signal-corps was placed entirely in the care of a chief with the rank of colonel. In 1870 a meteorological division was added, and in 1891 this was transferred from the war to the agricultural department. There is a school of instruction in military signaling at Fort Riley, Kansas, where, in a course of six months, are given thorough knowledge of all the codes and the practical use of the various sorts of apparatus, consisting of flags, the heliograph, the field-telegraph and telephone trains, used by day; and torches, lanterns, rockets, bombs and search-lights, used by night. The code used in visual signaling is based upon the Morse system of dots and dashes.

In the navy the *General Signal-Book* and the *Fleet Drill-Book* contain the code of day and night signals, so that, in order to send a certain message, it is necessary only to hoist flags representing the number of that message in the proper volume. At night, in place of flags, red and green fireballs are shot into the air to serve the same purpose. For long-distance signaling electric lights are used, and it is even possible to signal a ship below the horizon by casting searchlights upon the clouds.

The weather-bureau has perfected a system of signals by which it can publish the weather-forecasts. Throughout the country are stationed agents who observe the indications of the weather and telegraph forecasts to thousands of towns and cities which then display the appropriate flag, chosen singly or in combination from among the preceding. Temperature is forecasted by placing a black flag *above* the weather-flag for higher, and *below* the weather-flag for lower, temperature.



The approach of a cold wave is announced by displaying the above flag.



Along the seacoasts and on the Great Lakes the following flags signify the approach of dangerous winds:

When storms of exceptional violence are feared, the news is spread through the aid of rockets, whistles and other signals. The reports of the weather-bureau are given wide publicity, chiefly in the pages of the daily newspapers.

Sigourney (*sĭg'ẽr-nĭ*), **Lydia Huntley,** an American writer, was born at Norwich, Conn., Sept. 1, 1791. Her first publication was *Moral Pieces* (1815). She compiled books for the young, contributed to magazines and was one of the earliest women in America to enter authorship. She has been called the American Hemans. *Connecticut, Pocahontas, Tales* and *Letters to Young Ladies* are some of her books. She died at Hartford, June 10, 1865. Consult her autobiographic *Letters of Life.*

Sigsbee, Charles Dwight, American naval officer, was born at Albany, N. Y., Jan. 16, 1845, and graduated in 1863 from the United States Naval Academy. In the Civil War he served in the West-Gulf squadron and was at the battle of Mobile Bay; in the North Atlantic squadron; and at both attacks on Fort Fisher and the final assault on the fort. He also served on the Chinese station and at the head of various departments of the Naval Academy. He successively commanded the *Kearsarge, Dale, Constellation, Portsmouth* and the *Blake* in the deep-sea explorations undertaken by the United States coast-survey. He was in command of the battleship *Maine* when it was destroyed in Havana harbor, Feb. 15, 1898. During the Spanish-American War he commanded the United States auxiliary cruiser *St. Paul* in operations against Cuba and Porto Rico, and later was transferred to the *Texas.* In 1904 he attained the rank of rear-admiral. He published *Deep-Sea Soundings* and *The Story of the Maine*—a personal narrative.

Sigurd (*zĕ'gōōrd*) or **Sigurdr** is the hero of the Norse Eddas. Thus he is identical with the Siegfried of the *Nibelungenlied,* which is modelled on the *Volsunga Saga.* Sigurd is a hero, a descendant of Odin, who slays the dragon that guards the golden treasure, and, by eating the heart of the monster, is enabled to understand the songs of birds. He also succeeds in penetrating the flames which surround the house of the sleeping Brunhild, whom he awakens. They plight their troth; and Sigurd rides away. Under the spell of a love-potion he marries Gudrun; and is also persuaded under a spell to deliver Brunhild for Gunnar. Brunhild now seeks to slay Sigurd; but her heart breaks for love of him when he is finally slain by the half-brother of Gunnar.

Sikhs (*sēks*), a religious sect in northern India. The word means followers or disciples. It was founded by Baba Nanak in the 15th century, who rejected the caste-system and idolatry, and taught the worship of one God. At the end of the 16th century the holy temple was built at Amritsar, which is the headquarters of the sect. As they increased in numbers, they gradually assumed military power, and in the 18th century under Ranjit Singh (*q. v.*), a young warlike chief, they became a great military force in the Panjab. He kept the treaty he had made with Great Britain, but at his death his large and well-drilled army invaded British territory in India in 1845. After several battles and defeats they were at last conquered in 1849, and the Panjab was annexed. At the mutiny (1857) the Sikhs remained loyal to England. The Sikhs form about six per cent. of the population of the Panjab, and there are 15 protected Sikh states connected with the Panjab government. They number about 1,907,836. Consult Cunningham's *History of the Sikhs.*

Silas Marner, a story of humble life by George Eliot (1861), considered by many her finest work. To quote her own words, "the story sets forth the good influences of pure, natural, human relations." Silas, the linen-weaver of Raveloe, wrongly accused of theft, leads an isolated, miserable life, his one treasure, the savings of years, being stolen by the squire's son. In its place a little child, Eppie, strays into his cottage and fills his life with joy. Her influence drew him into the stream of the village-life, and he became a natural man again. There is a minor theme in the life of Godfrey Cass, a type of the deterioration of character. This contrast with the regeneration of Silas Marner forms the center around which the author weaves much of the details of the simple village-life. The story is a good moral tonic aside from its specific teachings.

Silesia (*sī-lē'shī-ȧ*), a province in south-eastern Prussia, covering 15,566 square miles. It is crossed by Oder River and the Sudetic mountains, between which is a very fertile region, while on the northern and eastern sides of the Oder there are marshy and sandy tracts. One of the most productive coal-mining regions of Prussia, covering 530 square miles, is in the south-eastern corner of Silesia, and there also are mines of zinc. The crops are the usual cereals and flax, beet-root, chicory and hops. The manufactures are important, including linen, cotton and woolen goods, beet-root sugar, metal manufactures, glass and tobacco. The capital is Breslau. The population, including 820,000 Poles, 55,000 Bohemians and 32,000 Wends, numbers 5,225,962. All schools are under the direction of the minister of public instruction, and elementary education is free and compulsory. Silesia in the 10th century was under Polish rule; about the end of the 12th century it was divided into Upper and Lower Silesia; and by the beginning of the 14th it was separated into a number of small states under King John of Bohemia, which in 1526 fell to Austria. Austria and Prussia struggled for the country, the claim of Prussia being based upon a contract by which the duke of Leignitz in 1537 left his lands to the elector of Brandenburg in case

he had no other heir. The three Silesian Wars (1740-42; 1744-45; and 1756-63 — the Seven Years War) ended in securing Silesia to Prussia, except the Austrian province of Silesia, a country south of Prussian Silesia, covering 1,987 square miles, rich in mines and with a population numbering 756,949.

Silica (*sĭl'ĭ-kă*), a compound of silicon and oxygen (SiO_2), is found in the pure state in the form of quartz or rock crystal. Flint, sandstone and chalcedony are nearly pure silica. It occurs also in combination in a large number of abundant minerals which are called silicates, and of which feldspar, mica, hornblende and clay are examples. Silica exists in many plants, particularly the grasses, in the quill-feathers of birds and in sponges. Most animals contain very little of it. Silicon, the nonmetallic element contained in silica, is never found in the free state. Although, next to oxygen, the most abundant element in the earth's crust, it is merely a chemical curiosity, being very difficult to separate from oxygen. Silica is largely used in making glass, and is an important constituent of porcelain, china, bricks etc.

Silicle (*sĭl'ĭ-k'l*), a short silique, the peculiar fruit of the mustard family. See FRUIT.

Silique (*sĭl'ĭk*), the peculiar pod-like fruit of the mustard family, characterized by a false partition which runs lengthwise and divides the pod into two chambers. See FRUIT.

Silk, the cloth and thread manufactured from the fiber obtained mostly from the cocoons of the silkworms. The making of silk probably originated in China, the wife of an emperor being credited with first unwinding a silk cocoon in 2600 B. C. The silkworms' eggs were brought to Constantinople from China about 552 by two Persian monks, who carried them in a hollow cane. They were successful in raising them and in introducing the manufacture of silk. The new industry spread through Greece, was carried into Sicily by prisoners of war, and brought to Spain by the Moors. Louis XI and Francis I imported workmen from Milan into France, and succeeded in starting the silk-manufacture after the cultivation of the mulberry tree for food for the worms had been established in 1564. In England silk-manufacture began under James I, but received a powerful impulse in 1685, when a large number of silk-weavers were driven to England by the Edict of Nantes. James I made an effort to introduce the industry into the American colonies, sending eggs to Virginia and offering rewards for their cultivation, but tobacco was more profitable. It was cultivated in South Carolina and Connecticut before the Revolutionary War. There have been several efforts to make the cultivation of the silkworm more general in the United States, one in California in 1854 and a Woman's Association formed in Philadelphia in 1876, but with no great result. The manufacture of silk is, however, carried on quite extensively, the center of the industry being Paterson, N. J., where there are more than 100 silk-factories. France is the principal silk-making country, the British silk-trade having been much injured by the introduction of French goods free. The process of manufacture takes the raw silk, obtained from the cocoons of the worm, by winding it off through a reeling-machine; cleans, twists and doubles the threads; and winds them on bobbins and reels for the weaver. There is a considerable amount of waste in all the processes, which, known as waste silk, was for a long time considered useless, but in 1857 a method of spinning yarn out of this waste was invented by Lister of Bradford, England, which has added very much to the industry. The process of weaving silk from the prepared thread resembles that of weaving cotton or woolen goods.

Silk'worm, any larva or caterpillar which produces a silken cocoon used in the manufacture of silk. The name applies especially to the famous silkworm (*Bombyx mori*) that feeds on the mulberry tree. All silkworms are the larvæ of moths. Their eggs are laid to the number of 200 or 300 by a single individual. On hatching, the caterpillars go through several moults. They eat ravenously save just before moulting, and many die during the change of skin. Silkworms are subject to various diseases, great numbers being attacked by a fatal fungous disease. Constant care must be used in rearing them, and strict attention paid to cleanliness, ventilation and temperature. When they reach the fifth stage they eat enormously, and attain a length of three or three and one half inches. They now are naked, worm-like animals of a pale greenish color. About 36 days or more after hatching, they begin the formation of the cocoon, in which they undergo the transformations that convert them into moths. The cocoons are the source of the silk. They usually are white or yellowish and about an inch or more long and half as broad. The silk comes from a pair of long, tubular glands which open upon the lower lip of the animal. As the material of a spider's thread hardens on contact with the air, so this silk substance is formed into a delicate strand.

SILK-WORM, LARVA, CHRYSALIS AND COCOON

While this is issuing from the orifice in the lower lip, the head of the worm is continually worked back and forth in such a manner that the thread is wound in spirals around the entire length of its body. There is formed in this manner one continuous thread of surprising length — being nearly four fifths of a mile long. The thread is matted together by a gummy substance. It is loosened in hot water, and the thread, united with those from four or five other cocoons, is unreeled. The process may occupy four days. There are several kinds of silk-producing larvæ, but all others are inferior to the mulberry silkworm. The *Ailantus* silkworm and the *Polyphemus* moth, with the larvæ of imported mulberry moths, are reared in America. The former feeds on oaks; the latter, the American silkworm, on the leaves of many different kinds of trees. There are various native silkworms. Many portions of the land would seem to be well adapted to silk-culture. China, Japan, Italy, France and India are the principal silk-producing countries. In the manufacture of silk the United States has made great strides in recent years. In 1905 there were 624 silk-mills, their capital $109,000,000. The gross value of products was $133,288,072. Pennsylvania and New Jersey are the principal silk-manufacturing states, Paterson, N. J., sometimes being called the Lyons of America.

Silliman (*sĭl'lĭ-man*), **Benjamin,** an American scientist, was born at Trumbull, Conn., Aug. 8, 1779. He studied at Yale College, and, after his appointment there as professor of chemistry, attended chemical lectures for three years at Philadelphia and for one year at Edinburgh and at London. He filled the chair of chemistry at Yale for about 50 years. He did much to make the study of chemistry and geology popular by public lectures through the country in 1808. He was the first president of the American Association of Geologists and Naturalists, and founded the *American Journal of Science,* known as *Silliman's Journal,* which he edited for 28 years. His textbook on chemistry was published in 1830. He died at New Haven, Conn., Nov. 24, 1864. See *Life* by Fisher.

Silo'am, a pool cut in the rocks southeast of Jerusalem and connected with it by an aqueduct.

Sil'vas or **Sel'vas** are the plains which center about the middle of the Amazon. They take their name from the thick jungle or forest with which they are clad. Their area is not far short of 1,000,000 square miles, one sixth of which is subject to periodical floods. No jungle is so thick as that of the *selvas,* where the sun hardly penetrates and mankind is represented only by a few Indians. Animal life, including jaguars, monkeys, birds, snakes and insects, is abundant and of great interest to the naturalist.

Sil'ver, one of the metals, ranking among the commoner metals next to gold in value. It is known by its white color, its luster and the ease with which it is worked. It is harder than gold and takes a fine polish. It is never found pure, being always mixed with a little copper or gold or some other metal, but in what is called its native state it is widely distributed. It is almost always found associated with gold, and all gold when mined contains more or less silver. The combinations of silver with other substances, as sulphur, oxygen and chlorine and especially in the ores of lead, form the largest part of the silver-ores found. In Europe the largest silver-mines are in Germany. Those of Norway have been worked since 1623, and in 1909 produced nearly $110,800. One piece of silver in Copenhagen Museum weighs 560 pounds, and another piece was dug out in Norway weighing over 1,500 pounds. Silver is also found in Spain, Italy, France and Turkey. The mines of silver in the United States are found mostly in Nevada, Arizona, California, Idaho, Utah, Colorado, New Mexico and Montana. Comstock Lode, a silver-mine in Nevada, probably is the most productive one ever worked. The silver-region of the western United States was discovered only in 1859, but now produces about one-ninth of the silver of the world, being $28,455,200 in 1909. The rich silver-mines of Mexico and Peru, worked by the Indians, were developed by the Spaniards after the conquests in the 16th century. Humboldt reports about 3,000 different mines in operation in Mexico, and in 1909 the production was valued at $38,450,100. Australasia is now added to the silver-producing countries, the yearly product of the silver-districts being $16,241,300.

Silver is one of the most useful of the metals, being used in coinage, plate and jewelry, and its compounds in photography, glass-staining etc. It is too soft to be used alone, and is generally mixed or alloyed with copper. Silver-coins in the United States contain one tenth of copper and nine tenths of silver. See METALLURGY. Consult Phillips's *Gold and Silver.*

Sim'coe, John Graves, was born in Northamptonshire, England, in 1752 and died in 1806. He was educated at Eton and at Merton College, Oxford, and when 19 entered the army. His regiment took part at Bunker Hill in 1775. He was appointed lieutenant-governor of Upper Canada in 1792, and took up his residence at Newark near the mouth of the Niagara River. The whole population of the province then did not exceed 20,000. There were a few settlers at Kingston, York, Newark and at the front in the Bay of Quinté district; and some roving bands of Indians. About two months after his arrival the first provincial parliament of Upper Canada met. It consisted of 16

1—Silkworm Eggs. 2—Silkworm. 3—Pupa in Cocoon. 4—Cocoon. 5—Male Moth. 6—Female Moth.
7—Unspun Silk. 8—Raw Manufactured Silk. 9—Manufactured Silk.

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Silk is made from the cocoons of the silk worm, a sort of caterpillar which is hatched from the eggs of a small moth. The picture shows the moth, the eggs which it lays, the larva or worm which is hatched from the egg and the cocoon which the silk worm spins. The egg is small and nearly round, looking much like a turnip seed. The moths are carefully kept, the eggs are collected and are kept warm until hatched. The worm when hatched is a tiny little thing, covered with long hair, has a shiny nose and sixteen small legs. The worms are fed with chopped mulberry leaves until they are full grown, which is about thirty-two days after hatching.

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Orchards of white mulberry trees are grown to supply food for the silk worms. Here we see an orchard in Japan where men are gathering mulberry leaves which will be taken to the rearing-house in which the worms are fed.

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The worms are kept in trays made of matting and these are placed on racks, for convenience and to give them plenty of air. The mulberry leaves are placed beside the worms which eat the tender parts between the veins of the leaf. When thousands of worms are eating, they make a sound like a gentle shower of rain. Here we see a tray of worms feeding on the leaves.

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When the worms are full grown and ready to spin, they are placed on twigs or coarse straws spread over frames, as we see in this picture. There are two long silk glands running along the sides of the body of the worm which open together on the under lip. The worm spins the cocoon by ejecting from these glands a fluid which hardens immediately, forming a thread of 800 to 1200 yards in length, moving its head around in regular order for about three days.

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The cocoons are brought to market in large baskets by the silk farmers. Here they are carefully examined and marketed. In natural order the worm in the cocoon is transformed into a chrysalis and later into a moth, which comes out of the cocoon. This ruins the cocoon for reeling and hence the cocoons which are to be used for the manufacture of silk are heated and the chrysalis killed.

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The cocoons are then sent to the reelers. A few of the cocoons are placed in a basin of hot water, which softens the gum; the outside fibres are removed so that a single thread runs free, just as you would unwind a thread from a ball; the ends are collected together through a guide and wound up on the reel, the fibres from the different cocoons making one single thread. This picture shows the old method of reeling by foot machine.

From Brown Bros.

This picture shows the new style of reeling in Japan, by power machinery.

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The raw silk is taken from the reel and twisted into skeins and placed in bundles. These bundles are packed in bales for shipment. This picture shows the raw silk in bales as it is received in this country. Here the bales are weighed and then opened and the bundles of skeins placed on shelves, ready for use.

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The skeins of raw silk, after having been soaked to soften the gum, are taken to the winding room which we see here. You will see the skeins placed on two long rows of swifts, one above and one below. From these the silk is wound onto bobbins, or large spools, which you see in the center, under the operator's hand.

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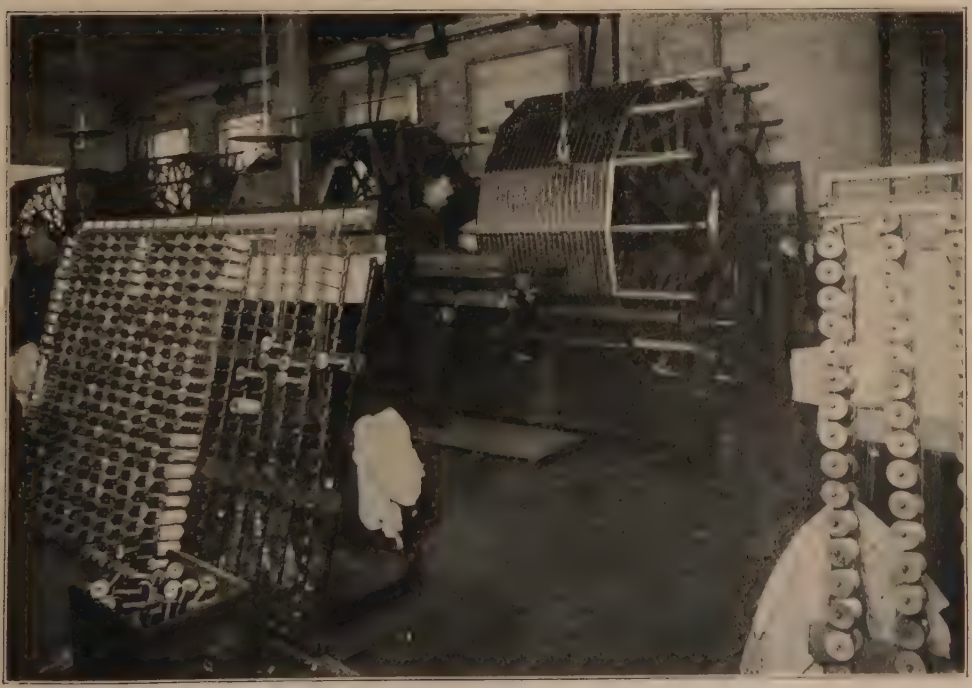
SPINNER. From the doubling frames the bobbins are placed on the spinner, as shown in this picture. On this machine the bobbins are made to revolve at great speed and the threads, which have been brought together on the doubling frame, are spun into one thread and carried onto another bobbin. In this way the various kinds of thread, as warp, sewing silk, machine twist, etc., are made.



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WARPING FRAME. The threads that run lengthwise in cloth are called warp. The warp is made by placing a large number of bobbins on a rack or creel, and running the threads from this on a reel into sections. The whole number of threads is then wound from the reel to a roll or loom beam. The picture shows the warping frame, the rack or creel, etc.

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DOUBLING FRAME. The bobbins on which the silk has been wound from the skeins are next placed on the doubling frame which we see here. The bobbins are placed on pins and the threads from several of them, according to the size of the thread required, are brought together and wound onto another bobbin. In this way various kinds of thread are made for different purposes.

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Here we have a picture of a modern silk loom on which silk goods are woven. The designs which are seen above are woven into the fabric and can be seen on the completed goods at the man's knees

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The last stage in the manufacture of silk goods is shown in this picture. Here expert workers are examining the completed goods for thread ends, etc. It takes a long time to become expert in this work, as it requires great care and skill.

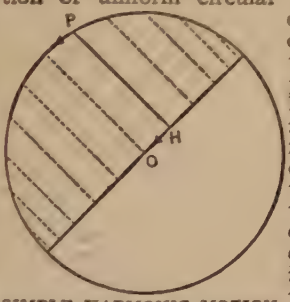
elected, and eight appointed, representatives. He selected York (since 1834 Toronto) as the capital. He took great interest in making surveys and locating roads, one being even now sometimes spoken of as Governor's Road. Simcoe County and Lake are called after him. A monument to his memory has been erected in Queens Park, Toronto, in sight of the new parliament buildings.

Simms, William Gilmore, American historian, novelist and poet, was born at Charleston, S. C., April 17, 1806, and died there on June 11, 1870. In early life he studied law, but abandoned it for journalism and, later, for literature. He specially devoted himself to writing a series of 17 volumes of fiction, including romances of colonial life, romantic tales of revolutionary incidents in South Carolina, of which he wrote a history, a geography of the state and an account of South Carolina in Revolutionary times. He for several years was a member of the legislature, and filled other political offices. He had, besides a fertile mind, a vivid imagination and the power of writing an interesting and realistic novel; he also wrote verse, of which a compilation exists. Of his novels perhaps the most notable are *The Yemassee*, *Guy Rivers*, *Pelayo*, *Carl Werner*, *The Scout*, *The Partisan*, *Count Julian*, *Mellichampe* and *Border Beagles*. His best, as it is his longest, poem is entitled *Atalantis: a Drama of the Sea*. See Geo. W. Cable's *Life* in the American Men of Letters Series.

Simonides (*sī-mŏn'ī-dēz*), a Greek lyric poet (B. C. 556–469), a native of the island of Ceos, though early in his career he appears to have been banished and took up his residence partly in the Peloponnesus, with occasional visits to the court of Hiero of Syracuse as well as to the ruling families (the Scopadæ in particular) of Thessaly. He became famous by his dirges, epigrams and funeral inscriptions in honor of those who fell in the Persian Wars as well as in praise of the Athenians who took part in the notable struggle. The chief theme of his song was, in an especial manner, the devotion of Leonides and his 300 at Thermopylæ. In his finished versification, as well as in the choice and variety of his themes, his song has been compared to that of Tennyson. Especially fine are his meter, language and thought. Another of his name is the Greek poet Simonides or Semonides of Amorgos, a native of Samos (about B. C. 660). Only fragments of his work, however, have come down to us.

Simoom (*sī-mōōm'*) or **Simoon,** a hot, suffocating wind, common in the deserts of Africa and Arabia. It is very much like a cyclone, with a calm center surrounded by whirling blasts of very hot air, the whole moving slowly from south to north or from east to west. It often carries along columns of sand, and is indicated by a purple atmosphere. It is very injurious both to men and animals, causing severe pain and a feeling of suffocation. It lasts only for a few minutes, not more than 20 at the most, and occurs in spring and summer. See Sirocco.

Sim'ple Harmon'ic Mo'tion is the projection of uniform circular motion upon a diameter of the circle. Referring to the accompanying figure, let P be a point moving with uniform speed in the circumference of the circle. From the point P, in each of its successive positions, imagine a perpendicular let fall upon the diameter there shown. The motion of the foot of this perpendicular H to and fro along the diameter is a simple harmonic motion, and is often indicated by the letters S. H. M.



SIMPLE HARMONIC MOTION

The circle in which we have imagined the point P to move is called the *circle of reference.* The radius of this circle is known as the *amplitude* of the S. H. M. The time occupied by one round trip of the point H to and fro across the diameter is called the *period* of the S. H. M. The angle between the radius OP and the radius from which angles are measured in this circle is called the *phase* of the S. H. M. The value of the phase at the instant from which time is measured is called the *epoch* of the S. H. M. The distance of the point H from the center of the circle at any instant is called the *displacement* of the S. H. M.

Any S. H. M. is completely described only when we know four things about it, namely: (1) the *amplitude;* (2) the *period;* (3) the *phase* at any time, t; and (4) the *direction* of motion of the point P in the circle of reference. If we denote the amplitude by A, the period by T, the phase by O and the displacement at any instant, t, by x, then the equation of S. H. M. is

$$x = A\cos.\ \frac{2\pi}{T}t$$

where $\frac{2\pi}{T}t = 0$

No one motion in nature is more frequently met with than S. H. M. The motion of a freely suspended pendulum-bob is practically simple harmonic. A ball suspended by a vertical, spiral spring oscillates up and down in a vertical line with a S. H. M. Air-particles set in motion by a tuning fork vibrate to and fro with

a S. H. M. Ether-particles when traversed by a ray of light probably vibrate with a S. H. M. Consult Worthington's *Dynamics of Rotation* or Daniell's *Physics* for more complete discussion.

Simp'son, Sir **James Young,** a Scotch physician, was born in Linlithgowshire, June 7, 1811. He studied in Edinburgh, attracting attention by his ability and especially by his thesis on *Death from Inflammation* when he took his medical degree He rose rapidly in his profession, contributing largely to the renown of the Edinburgh school. In 1847 he was made one of her Majesty's physicians for Scotland His greatest claim to distinction rests on his introduction of chloroform into medical use in March of 1847. His publications include a large number of medical works. He died on May 6, 1870. A bronze statue of him was erected in Edinburgh in 1877. See *Memoir* by Duns.

Sinai (*sī'nī*), a mountain in northwestern Arabia, known as the place where Moses received the tables of stone inscribed with the Ten Commandments. The mountain is a single peak in a great rocky mass which almost fills the peninsula of Sinai, a point between two arms of the Red Sea: the Gulf of Suez and the Gulf of Akaba. There are three separate mountains, Mount Catherine being the one usually thought to be indicated by the name Sinai. This mountain has two peaks, the northern one, known as Mount Horeb, and the southern one, called the Mountain of Moses. This sonthern peak is generally agreed upon as the place of the giving of the law, though it is still disputed. At its foot is the Church of St. Catherine, built about 527 by Emperor Justinian; a little higher up, the chapel of St. Elias; and on the summit a little pilgrim-church. The whole peninsula, as well as the bold, jagged mountains, has a stern, treeless aspect, though palms acacias and tamarisks grow in the ravines. The Bedawin Arabs range over the region with their sheep and goats. There are many caves among the mountains, which have been the abodes of hermits, and many inscriptions on the rocks which date back to the era of the early Christians. Consult Dean Stanley's *Sinai and Palestine* and E. H. Palmer's *Desert of the Exodus.*

Singapore (*sĭn'gȧ-pōr'*), ("Lion City"), a town of India on the island of Singapore. It was founded in 1819 for the British trade in the East Indies, and is the most important trading-place in southeastern Asia. It is a well-built town, with fine public buildings and all kinds of conveniences in the way of public works. There are a governor's residence, a Protestant cathedral, a Roman Catholic cathedral, Mohammedan mosques, Hindu temples, Chinese joss-houses, a museum, hospitals and fine botanical and zoölogical gardens. The harbor is large, and is used as a naval coaling-station and depot. The island is 27 miles in length and 14 miles in breadth and has an area of 206 square miles. The population, numbering 311,985, includes 135,000 Chinese, 25,000 Malays and about 4,300 Europeans. Singapore, a crown-colony in the Straits Settlements, embraces Christmas and the Cocos Islands, the other settlements being Penang and Malakka. The climate is pleasant, though the death-rate is high.

Sin'gle Tax. A theory of taxation which proposes to abolish all taxes that fall upon property gained through industry and economy, substituting a single tax on land equal to its rental value exclusive of improvements. Thus the "unearned increment," as represented by the increasing value of land, would accrue to the benefit of the community as a whole and not to the private owner as at present. It would probably result in state ownership. This form of taxation was proposed and earnestly advocated by Henry George, who presented his argument in *Progress and Poverty* in 1879, and in his New York City mayoralty campaigns in 1886 and 1897. The Single-Tax National League of the United States, in a national conference in New York City, 1890, adopted a platform drafted by a committee of which Mr. George was chairman. Since the death of Mr. George in 1897 the movement has lost in adherents and in political influence. The theory has gained world-wide prominence. Tom L. Johnson, Mayor of Cleveland, and Ex-Governor Garvin of Rhode Island are politically successful single-taxers. The party in the United States has acted with the Democrats and in England with the Liberals. There they hold office in many cities and claim that their adherents control Glasgow; but on the Continent they have barely gained a foothold. The single-taxers now demand a separate assessment of personal property, land and improvements on land and that local political units be authorized to place a tax upon land-values and to free personal property from taxation.

The arguments in favor of the single tax are based upon the two principles of equity and convenience. First, the right of private ownership is given by labor only, and, as land in no way is a product of man's labor, it should be equally shared by all; the increase in the value of land depends upon the development of the community, and therefore the increment should belong to the community rather than to the individual. Second, land can be easily assessed and always guarantees payment of taxes. The weight of such a tax will, it is claimed, be equal upon all and will not bear upon production and industry. The tax would be assessed upon land according to its

value, and would discourage holding land for speculation, since it must pay in proportion to value rather than income. It would tend to equalize the distribution of wealth, since the natural increase in the value of land would go to the community, and, finally, tend to a large increase of social wealth.

The objections come from those who believe in private ownership of land and from Socialists. The former hold (1) that the landowners have put their industry into the land, even if they have not produced it; (2) that single tax would not produce sufficient revenue; and (3) that the sense of private ownership of land has been the "keystone of society." Socialists hold that both land and capital should be the property of society; that capital is not the product of the labor of any individual or of the few; and that, therefore, single tax would be only a half-solution and one that would not benefit society. See GEORGE, HENRY, and SOCIALISM.

Sioux (*sōō*), a group of tribes of American Indians belonging to the Dakota family. They are the principal tribe of the family, and sometimes their name is given to the whole family. They were living near the head-waters of the Mississippi when found by the whites. In their wars with the Chippewas and the Hurons some of them were driven farther south, but in 1822 they numbered about 12,000 and their lands stretched from the Mississippi to the Black Hills. In 1837 and in 1851 they ceded parts of their land to the United States. The failure of the government to carry out their treaties irritated the tribes, and they troubled the white settlers for years and in 1862 made a general uprising, killing nearly 1,000 whites. New Ulm, in Minnesota, a town of 1,500 people, was nearly destroyed. This rebellion ended in the imprisonment of more than 1,000 Indians and the execution of 39 of the leaders, and cost the United States $40,000,000. The Santee Sioux were placed on reservations near Yankton, S. D., where they have become peaceful farmers. After a vain endeavor to settle matters peacefully, Sitting Bull (*q. v.*), a young chief, and others going to Washington for the purpose, the hostile tribes gathered in northern Dakota and began the war of 1876, in which General Custer perished. Large settlements of the Sioux have been made since in South Dakota. In 1890, under a "messiah," there was another rising of the Sioux in the northwest. They now number about 25,000. Consult Riggs's *Forty Years among the Sioux*.

Sioux City, Ia., a city on the Missouri, which is crossed by a bridge 2,000 feet long, and by a combination structure for the use of wagons, street-cars and railways. It is a railroad-center and a manufacturing city, and has a large trade, being situated in a fine farming-region. There are large meat-packing establishments and flaxseed-oil mills and vast quantities of stoneware; 25,000,000 bricks a year are made. Among the notable buildings are the city-hall and public library, the Federal building and the Young Men's Christian Association building. The city has a good system of public schools, the high school erected at a cost of $100,000, and here is Morningside College, a Methodist Episcopal institution. It is the county-seat of Woodbury County. Population 47,828.

Sioux Falls, So. Dak., the largest town in the state, is on Big Sioux River and takes its name from the falls which descend 90 feet and afford an excellent water power. The city was laid out in 1857, and destroyed by the Sioux in 1862. It was rebuilt in 1865 after Fort Dakota was abandoned. The buildings are nearly all of red quartzite. The great industry is the quarrying and polishing of the quartzite underlying the city. There also are numerous manufactories, 66 wholesale houses, a state penitentiary, a public library, six banks, ten public schools, six colleges and denominational schools, twelve churches and six railroad-systems. It is the county-seat of Minnehaha County. Population 14,094.

Siphon (*sī'fŏn*), an instrument for transferring liquid from a vessel at one level to another at a lower level. The simplest possible form is shown in the accompanying figure, where the liquid A is being emptied into the vessel D. In order to start a siphon the pressure of the air must be diminished in the branch C D. The pressure of the atmosphere on the surface B then forces the liquid up the arm A C, and, in flowing down the arm C D, this liquid acts as a pump and keeps the pressure in C D below that of the atmosphere. Evidently, however, this pumping must cease as soon as the liquid in the vessel D rises to the same level as the surface B. It is also clear that, since the water is driven up into the arm A C by means of the earth's atmosphere, no siphon will work in a vacuum. The safest and most convenient form of siphon, especially

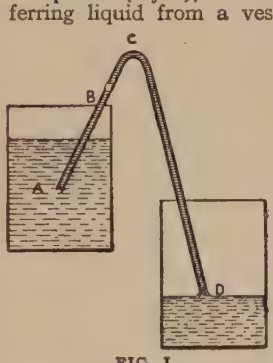


FIG. 1

FIG. 2

for transferring acids is that shown in figure 2, which is provided with a mouthpiece for starting, but without danger of getting acid or poison into the mouth. The action will be evident from the figure.

Siphonogamy (*sī-fŏ-nŏg'ă-mĭ*), a condition in plants in which pollen-tubes are developed for the transfer of the male cells to the eggs. The seed-plants are siphonogamous; while in the lower plants the male cells usually swim to the eggs. As a consequence, the *Spermatophytes* are called Siphonogams by some botanists.

Si'rens, sea-nymphs in Greek mythology, who sat on the shores of an island off the southwest of Italy and by their songs lured passing sailors to death. The *Odyssey* tells the story of Ulysses stopping the ears of his companions with wax and lashing himself to a mast, till they had sailed out of hearing of the fatal songs. The Argonauts also were carried past in safety, because the music of Orpheus had a stronger spell, seeing which the sirens threw themselves into the sea and were turned into rocks. By the Latin poets they are represented with wings, and in art as birds, with the faces of young women. Consult Harrison's *Myths of the Odyssey in Art and Literature.*

Sir'ius. See DOG-STAR.

Siroc'co, a hot wind which blows on the southern coasts of Italy, lasting sometimes a week. It is hottest in Malta and Sicily, but does not last as long as on the Ionian Islands. It is like the simoom, and produces the same feeling of suffocation and exhaustion. See SIMOOM.

Sisyphus (*sĭs'ĭ-fŭs*), in Greek mythology, the son of Æolus, the founder and king of Corinth, and noted for his wickedness, for which, according to Homer, he was condemned to roll a large stone up a hill, which, when it reached the top, fell back again, so that his task was never ended.

Sit'ka, the former capital of Alaska, on the west coast of Baranof Island. It has a deep harbor, dotted with islands, with snowy peaks rising behind the town. There are a fine green-spired Greek church and an old Russian palace. The climate is cold, with a large rainfall. Population 1,395. See ALASKA.

Sit'ting Bull, an Indian warror of the Sioux (*q. v.*) was born in 1837. When gold was found in the Black Hills, an effort was made by the United States to purchase the land of the Sioux, to whom it belonged. They were very unwilling to give it up, and Sitting Bull, Red Cloud and Spotted Tail, with other chiefs, visited Washington in May, 1875, but would not sign the treaty. The failure of the government to keep its promises and the actions of the settlers in pushing on to the lands kept up a feeling of hostility, and the young braves gathered around Sitting Bull in northern Dakota. General Custer, with a small force, was sent against them, and he and his followers were all killed; but the Sioux were at last conquered and Sitting Bull escaped to Canada, but on promise of a pardon surrendered. In the rising of the Indians of the northwest in 1890 Sitting Bull was killed.

SITTING BULL

Six'tus, the name of five popes.

Sixtus IV was born on July 22, 1414, near Savona, Italy. He had a great reputation as a preacher throughout Italy. He became pope in 1471. He exhausted the treasures of the papal church in providing for his relatives, and took part in a conspiracy against the Medici at Florence. Learning and, especially, the improvement of Rome owed much to him. He built the Sistine chapel and the Sistine bridge across the Tiber, increased the Vatican library, and patronized the great painters of his time. His union with the Venetians against the duke of Ferrara brought on an Italian war, which ended in the breaking up of the Venetian alliance. The pope is said to have died from mortification at this result, Aug. 13, 1484. Consult Ranke's *Lives of the Popes.*

Sixtus V, one of the ablest of the popes, was born on Dec. 13, 1521, near Montalto, Italy. He was a professor of theology at Rimini and Siena, an eloquent preacher, vicar-general and cardinal. While Gregory VIII was pope, Sixtus lived in retirement and was thought to have become old and infirm, which recommended him to the cardinals, who were to select a successor to Gregory. But those who thought to lead him were soon undeceived by his vigorous administration. He stopped disorder, improved the working of the laws, and gave liberty to the Jews to worship in their own way and trade in his dominions. He built the library buildings of the Vatican, authorized a new edition of the Septuagint and the Vulgate, and in every way carried out his policy of increasing the power of the Roman church against the Huguenots, the Lutherans and Queen Elizabeth. He died on Aug. 27, 1590. Consult Ranke's *Lives of the Popes.*

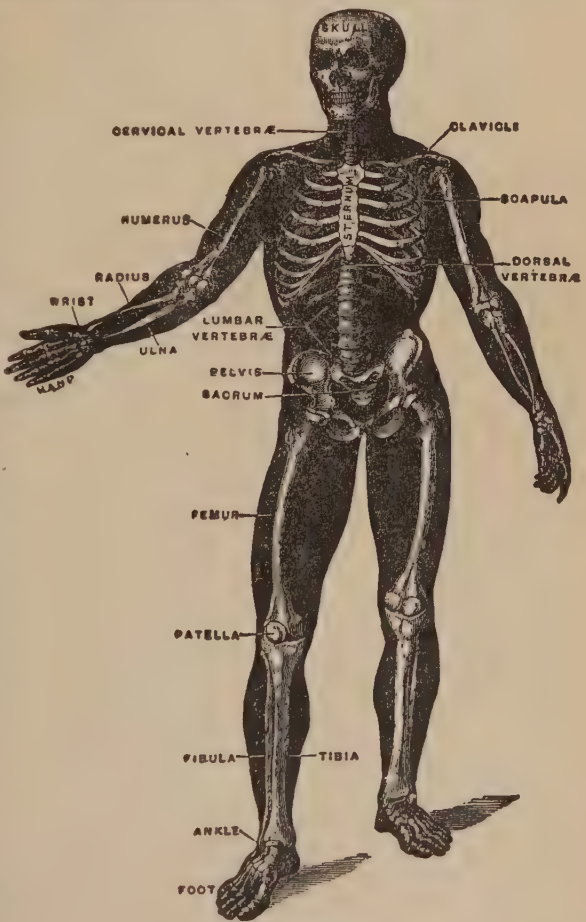
Skag'er-Rack (*sgăg'ĕr-răk*), an arm of the North Sea, between Denmark and Norway. It is 140 miles long and 70 broad. It is subject to violent storms, but when quiet the current runs east on the coast of Denmark and west on that of Nor-

way. The harbors are all on the coast of Norway.

Skate, a common name of several kinds of the ray. The tobacco-box skate, barn-door-skate and briar-skate are American varieties, and the tinker and the gray skate are found in Scotland and in England. Their egg-cases, called mermaid's purses, are often thrown upon the beach. The flesh is coarse, and the expanded fins are the parts usually eaten.

Skat'ing is moving on the ice by means of steel blades fastened to the soles of the shoes, called skates. In early times the shin-bones of animals were tied to the feet, and, by using a stick to push with, the wearer could move over the smooth surface of the ice. Skates now used are of two kinds, those for speed and those for figure-skating. The blades for speed-skating are very thin and are longer than the foot, while those for making figures are broader and are rounded at the toe and heel. In the northern countries of Europe, where the ice has a slight covering of snow, skating is very popular. The motion is rapid, the Frieslanders often traveling 15 miles an hour. Skate-racing is often practiced, the fastest time yet made being a mile in two minutes and 52 seconds. Figure-skating is practiced in America, Canada, Holland, Germany, Norway, Sweden and Denmark. Ice-rinks are used for this amusement, and are often crowded with spectators. Wheel-skates or roller-skates were invented in 1865, by Mr. Plimpton, of New York, though a form of them had been patented in France in 1819. The use of them is a fine preparation for skating, and the amusement has been very popular.

Skel'eton, the hard parts of an animal. Accepted in this broad sense, the skeleton includes the hard outer covering or exoskeleton and the inner bones or endoskeleton. As examples of exoskeletons we have the shells of clams, snails and other mollusks; the shell or *test* of the sea-urchins; the limy plates of the star-fishes; the shell of the lobsters and cray-fishes; the bony carapace and plastron of turtles and the like. The internal bony framework of vertebrated animals is an endoskeleton consisting of bones and cartilages. The comparative study of endoskeletons leads to many interesting conclusions. There are similar or homologous parts in all. For example, the wing of a bat or bird is constructed on the same plan as the flipper of a seal, the fore-limb of a dog, a horse or a man. That is, corresponding bones can be made out in them all. The same is true of hind-limbs and other parts of the skeleton, including the skull. This serves to unite animals on the line of similitude of structure. The hard parts are for protection, when on the outside, and also for the attachment of muscles. Not only is there correspondence between the bones of different animals, but the muscles, nerves and blood-vessels are similar. The fossil bones of extinct animals have furnished clues to the past history of life on the globe. There are upwards of 200 separate bones in the human skeleton. The actual number of distinct bones varies at different periods of life; many bones which are separated in youth become united in old age. The skull has 22 distinct bones in early adult life; but in youth the number is larger and in old age less. There is a tendency for the bones to unite in old age. There originally are 33 separate bones in the spinal column.



HUMAN SKELETON

Twenty-four remain distinct through life, while the lower nine become consolidated into two groups: the sacrum and the coccyx. Twenty-four ribs bound the chest, and most of them are connected by cartilage with the breast-bone or sternum. The shoulder-blades, the collar-bones and two hip-bones are connected with the arms and limbs respectively There are 30 bones in each arm and the same number in each leg, counting the knee-pan. The bones are held together by ligaments. See the illustration for further names. See FOOT, HAND and SKULL.

Skim'mer, a class of web-footed, long-winged sea-birds, belonging to the gull family. They have a long, thin bill with the upper half shorter than the lower. There are only three known species, each being confined to one country. The American skimmers, called shearwaters, skim along the surface of the water in flocks, using the lower part of the bill as a plow to bring up the small fish on which they feed and holding them with the upper half of the scissors which their bills form. They are also called scissors-bill or razor-bill shearwaters. The other varieties are found in Asia and Africa. See GULL.

Skin, the investing membrane of the body of an animal. In vertebrated animals it consists of two layers: an outer epidermis and an inner dermis or true skin. The former is largely for protection, the latter plays an important part in physiology. The epidermis has neither blood-vessels nor nerves, but the true skin is richly provided with both. The dermis is made of a dense felt-work of fibers, and in the human body is from one fiftieth to one tenth of an inch in thickness in different parts of the body. Its outer surface is raised into little hillocks called papillæ. These are of two kinds — the vascular papillæ containing a network of minute blood-vessels, and the nervous papillæ in which the nerves terminate. There often is an oval touch-corpuscle in which the nerve has its ending. The epidermis lies on the dermis and dips into all of its depressions. It is composed of cells, the outer layers of which are reduced to flattened, scale-like elements, which are continually falling off or being removed by bathing and friction. They are as continually renewed from a deeper layer of plump cells which divide rapidly. Thus the outer skin has two layers — a horny layer and a mucous layer. The latter is the seat of the pigment or coloring granules which impart color to the skin. In negroes it includes a rather dense layer of dark granules. All over the body the skin has minute orifices which are the openings of small tubes connected with the sweat-glands. These consist of coiled tubes in the deepest part of the true skin or just below it. A tubular duct extends from each gland to open on the surface, and as it passes through the layer of the skin it runs in spirals like a corkscrew. The number of sweat-glands varies greatly in different parts of the body; they are fewest in the back and neck, being about 400 to the square inch. On the skin of the palm and sole there are two or three thousand to the square inch. Hairs, nails, hoofs, scales and like structures are outgrowths from the epidermis of the skin. (See HAIR and FEATHERS.) The skin performs important offices. The watery vapor passed off by it in the form of perspiration amounts to about 2½ pounds a day. It also liberates carbon dioxide. In some animals, as frogs, it is an important aid in respiration. It is also concerned in regulating the temperature of the body. When the body is covered with a varnish or layer of leaf-metal, death results, not from stopping the perspiration as was formerly supposed, but by radiation of heat and fall of bodily temperature — the skin being unable under the conditions to regulate the temperature. The touch-corpuscles in the skin give it an important sensory action in connection with the nervous system.

Skull, the hard framework of the cranium including the lower jaw. The skull in fishes and in mammals, although so different in general appearance, is composed of corresponding bones. They are more separated in the fish, and more modified and united in the higher animals. In sharks and other cartilaginous fishes the skull may be entirely cartilaginous throughout life. The question of the nature of the skull perplexed naturalists for a long time. Early in the 19th century Oken, the German philosopher, and Goethe, the poet-philosopher, declared the skull to be composed of modified vertebræ. This idea was extensively developed by Richard Owen, in his great work on *Comparative Anatomy of the Vertebrates*. Thus arose what was called the vertebral theory of the skull. Huxley, however, in 1859 showed that the bony cranium is preceded by a skull of united cartilage, having neither sutures nor joints. The bones are formed later, being mostly laid down in the membranes surrounding the original cartilaginous skull, which disappears. Consequently the bones are not primary structures, and the history of the skull shows that they cannot represent modified vertebræ. By comparing the skulls of different animals corresponding bones can be identified, but the study is technical. Consult Huxley's *Anatomy of Vertebrated Animals* and Parker and Bettany's *Morphology of the Skull*.

Skunk, a carnivorous animal widely known on account of the offensive odor of a fluid which it ejects when frightened or disturbed. There are several varieties found only in the New World both in North

and South America. The common skunk is about the size of a small cat, and ranges from Hudson Bay to Guatemala. The body is rather stout, the tail very bushy, and the prevailing colors black and white. It usually is black, with broad stripes of white running lengthwise. These animals burrow and are active at night. They feed on mice, salamanders, frogs and eggs of birds that nest very low. Sometimes they rob hens' nests, but this is by no means the rule. They are of positive benefit to the farmer on account of the large number of beetles, grasshoppers and field-mice which they destroy. Ordinarily they do not run at the approach of man, but, conscious of the protection of their nauseous secretion, move away deliberately. They can eject this fluid at will eight or 12 feet. They prowl around chiefly at dusk and after dark. They are quite bold and fearless, coming close to camp and dwelling, a pair often taking up abode under barn or porch. The flesh is said to be white and sweet. Owing to the present scarcity of the more valuable fur-bearers, the fur of the skunk is now extensively used, and in the market goes under the name of Alaska sable.

Skye (*skī*), the largest island of the Hebrides, off the west coast of Scotland. It is 49 miles long and from seven to 25 broad. It is mountainous, with a few tracts of pasture and one large plain. The highest peak of the mountains, called Coolin Hills, is 3,234 feet high. Lake Coruisk, the "dread lake" of Scott's *Lord of the Isles*, and Glen Sligachan, thought to be the grandest glen in Scotland, with columns and cliffs over 1,000 feet high, with waterfalls leaping over them and deep caves at their foot, are among the interesting scenery. Fish abound, and with potatoes form the main diet of the people and also furnish the principal industry. The inhabitants (who chiefly are crofters) are principally Celtic, speak Gaelic, and number 14,608. The principal proprietors are Lord Macdonald and MacLeod of MacLeod. Consult Smith's *A Summer in Skye*.

Sky'lark, an European bird that mounts high in the sky and sings on the wing. It is the lark of the poets. The larks of America belong to a different family. See LARK.

Sladen, Douglas (Brooke Wheelton), was born in London, England, on Feb. 5, 1856, and educated at Trinity College, Oxford, becoming first professor of history in the University of Sydney, N. S. W., spending four years in that colony. He has travelled extensively and published much about the countries he has seen, being an extensive contributor to Australian literature. In this connection may be mentioned *Australian Lyrics*, *Poetry of Exiles*, *A Summer Christmas*, *Australian Ballads*, *A Century of Australian Song* and *Australian Poets*.

Slate. See SHALE.

Sla'ter, Samuel, an Englishman who introduced the manufacture of cotton into the United States, was born at Belper, Derbyshire, in 1768, and died at Webster, Mass., in 1835. Slater was an apprentice under Strutt, the partner of Arkwright. When he quitted England (1789), he did so secretly for fear that efforts might be made to prevent him from introducing Arkwright's machinery abroad. Relying wholly upon his memory, however, he did so; and in 1790 he succeeded in founding the first American cotton-factory at Pawtucket, Rhode Island. He afterwards built mills at Webster, Mass. The town of Slaterville grew up from the homes of his workmen. In 1816 Slater also built woolen-mills at Webster, Mass. He was a liberal and philanthropic employer and the founder of schools for the children of his workmen.

Sla'very, the condition of a man who belongs to a master, who has the right to employ him and treat him as he pleases. It probably arose first from captives made by war. It was general among ancient nations, including the Jews. In Greece slaves were employed not only for domestic service, but as bakers, tailors, seamen, miners, soldiers and police. They usually were mildly treated and were often freed. A slave was not allowed to wear his hair long or to enter the gymnasia and public assemblies, but could appear in the temples and at festivals. At one time there were 200,000 slaves in Attica, three times the number of the freemen. Roman slavery was very severe, as is seen by their gladiatorial combats. Old and useless slaves were often left to starve on an island in the Tiber. The cruelty of the masters was gradually softened by the law, a very cruel one being obliged to sell his slaves. The slave could not own property, though sometimes allowed a small portion of his gains when in trade, and could not testify in the courts. In Britain the Anglo-Saxons made slaves of the Celts and other natives, and had a regular trade with the continent in Irish slaves; but with the Norman conquest slavery was merged into serfdom. The traffic in slaves continued among Mohammedan nations, Christian captives being sold as slaves in the markets of Asia and Africa. The Barbary corsairs, down to 1812, carried off large numbers from the coasts of Europe into slavery. Cervantes, for five years a slave, reports 25,000 Christian slaves in Algiers alone. During the middle ages in Europe the class called serfs were, practically, slaves. They were usually attached to the soil and could be transferred with the land they tilled. They could not hold property, but their oath was taken in evidence and, if injured, they were protected by law.

Serfdom died out in England and in Scotland gradually, a curious form remaining in Scotland to the end of the 18th century. Colliers and saltworkers were bound by law, on entering a coal-work or salt-mine, to life-service there; their labor was transferred with the ground; and their sons could follow no other trade nor seek employment in other mines. In France the Revolution swept away the last remains of serfdom, and in Italy it had ended in the 15th century. It was abolished in 1781 in Bohemia and Moravia, and entirely destroyed in Prussia by the reforms of the 19th century, though the mass of the peasants had been free since the end of the 13th century, while Russia put an end to the system in 1861.

Negro slavery of modern times was a result of the discovery of America, the Spanish introducing them first into the New World to work their mines and plantations. They were first used to any extent in Haiti, in San Domingo. Sir John Hawkins was the first English slave-trader, followed by others, until England had carried to America 300,000 slaves between 1680 and 1700, and 610,000 into Jamaica alone between 1700 and 1786. The slave-trade was very inhuman, the negroes being so crowded on the ships that a large proportion died on the passage. The first efforts to restrain slavery were made to stop the slave-trade. In 1787 a society for this purpose was formed in London, with such supporters as Clarkson, Wilberforce, Zachary Macaulay and Sharp. After years of struggle the abolition bill, making all slave-trading by British subjects illegal after Jan. 1, 1808, became a law on March 7, 1807. The movement continued until, on Aug. 28, 1833, an emancipation bill was passed giving freedom to all slaves in the British colonies. Slavery was abolished in the French colonies in 1848, in the Dutch ones in 1863 and in Brazil in 1888.

When the American colonies became the United States in 1776, there were 300,000 slaves in the country, and in 1790, at the taking of the first census, they numbered 697,897, and were in all the states except Vermont and Massachusetts, to which Maine then belonged. The northern states gradually abolished slavery, Pennsylvania having 64 as late as 1840. In the south many, with such leaders as Washington and Jefferson, opposed slavery until the invention of the cotton-gin made it profitable and developed it, when even the renewing of the slave-trade with Africa, abolished by the United States in 1808, was advocated. The contest between the upholders and the opposers of the system, beginning in the north with the formation of societies for the gradual abolition of slavery and carried on by literature, lectures and, finally, political parties, was met in the south by demands for enlarged territory and national laws protecting their slave-property in the free states. The Pennsylvania Abolition Society was founded in 1775, with Benjamin Franklin as president, and the New York Society, with John Jay and Alexander Hamilton as leaders. In 1831 Garrison established *The Liberator*, the antislavery journal. The formation of a northern republic, free from slavery, was the hope of the extreme abolitionists, as the formation of a southern republic founded on slavery was the aim of the extreme proslavery party. The contest ended in the Civil War of 1861–65, in the course of which the proclamation of emancipation was issued by Lincoln, Jan. 1, 1863, setting free nearly 4,000,000 slaves, and confirmed in 1865 by an amendment to the constitution approved by 27 of the 36 states.

Slavery still exists, and the slave-trade is carried on by Arab slave-traders in the interior of Africa, the tracks of their caravans being whitened by the bones of those who have died on the journey, and by the Portuguese. The Congo Free State, the foundation of missions and the encouragement of trade by the British and German companies, with the help of all Christian governments, will, it is hoped, finally end the terrible traffic, in which over 90,000 000 Africans have been enslaved. Consult Clarkson's *History of the Slave-Trade* and Wilson's *Rise and Fall of the Slave-Power in America.*

Slavs (*slävz*) or **Slavonians** (*slȧ-vō'nĭ-anz*), the name of a group of nations belonging to the Aryan family, living in the eastern parts of Europe and northern Asia. The earliest history represents them as living around the Carpathian Mountains and spreading to the Baltic, the Elbe and over the whole peninsula between the Adriatic and the Black Sea. Since the 7th century they have become settled and gradually formed into independent states. There are two divisions, the southeastern and the western. The Russians, Bulgarians and Illyrians belong to the first division; the Poles, Silesians and Pomeranians, called Lechs, the Czechs or Bohemians and the Slavonic tribes of north Germany make up the western division. The only people that have preserved their language are the Wends or Serbs of Saxony and Prussia. The whole Slavonic population is about 100,000,000. They are represented by ancient writers as an industrious race, living by agriculture and having flocks and herds. The government, at first patriarchal, was gradually usurped by the chiefs and the people were reduced to serfs There was no middle class between the nobility and the peasants. See LANGUAGES and LITERATURE.

Slidell (*slī-dĕl'*), **John,** an American lawyer and politician, was born in New York

City about 1793, and died at London, England, July 29, 1871. After graduating at Columbia College, he studied law, and, removing to New Orleans, practiced there and became a leader in Louisiana politics. From 1842 to 1845 he served in Congress as a state-rights Democrat. From 1853 to 1861 he was a member of the United States senate, and in the Civil War, when Louisiana seceded, he withdrew and was appointed Confederate minister to France. In company with James M. Mason, who was named minister to England, both were taken on the high seas by Captain Wilkes of the United States navy and brought as prisoners to the United States, where they were confined in Fort Warren. On the demand of England they were released, however, and proceeded on their respective missions. In France, aided by the sympathy of Napoleon III for the Confederate government, Mr. Slidell, though unable to secure recognition for his government, procured a ship, the *Stonewall*, for the Confederacy, and negotiated with French capitalists for a loan of $15,000,000. After the war closed, Mr. Slidell settled in England and resided there until his death.

JOHN SLIDELL

Slime-Moulds. See MYXOMYCETES.

Sloane, William Milligan, American educator and author, was born at Richmond, O., Nov. 12, 1850, and graduated at Columbia College in 1868, continuing his studies at Leipsic and at Berlin. At Berlin he acted at the same time as secretary to George Bancroft, then United States minister to Germany, aiding him in his historical work. From 1876 to 1883 he was assistant and professor of Latin at Princeton University, and from 1883 to 1896 occupied the chair of history, with intervening visits to Europe. Since 1896 he has been Seth Low professor of history at Columbia University, New York City. He has also been editor of the *New Princeton Review* and one of the conductors of the *American Historical Review*. Among his writings are the *Life of Renwick Sloane* (his father), *The French War and the Revolution*, *Life of James McCosh* and *Napoleon Bonaparte, a History*.

Slo'cum, Henry W., American general, was born on September 24, 1827, at Delphi, Onondaga County, N. Y. He graduated from West Point in 1852 and was assigned to the 1st artillery, with the rank of second lieutenant. After promotion to first lieutenant in 1855, he resigned in 1856, practiced law at Syracuse, and was elected to the legislature in 1860. On the outbreak of the Civil War he was commissioned as colonel of the 27th New York volunteers and took part in the first battle of Bull Run. In August he was made a brigadier-general, taking part in McClellan's peninsular campaign in 1862. He distinguished himself at the battles of Gaines' Mill, Glendale and Malvern Hill and was promoted to major-general of volunteers He fought at second Bull Run, South Mountain and Antietam, and as commander of the 12th corps rendered signal service at Fredericksburg, Chancellorsville and Gettysburg. Later he was transferred with his corps to the army of the Cumberland, succeeded to the command of the 20th corps, and was the first to enter Atlanta. In Sherman's march to the sea and through the Carolinas he commanded the left wing, taking part in the actions of that campaign. After the war he took up the practice of law at Brooklyn and was elected to Congress in 1870 and 1884. He died at Brooklyn, N. Y. April 14, 1894.

Sloe, a wild plum, also called blackthorn. It is a shrub growing from four to ten feet high though sometimes forming a small tree. The branches end in sharp points or spines. The flowers are white, appearing before the leaves. The fruit about the size of large peas, is sometimes made into preserves, but is bitter and little used. The leaves resemble tea-leaves and have been used to adulterate tea, and the juice is used in making an inferior port-wine. The wood takes a fine polish and is used for tool-handles and canes. The sloe is thought to be the original of all the European varieties of the plum.

SLOE

Slot-Machine', a familiar, mechanically adjusted contrivance for vending chocolate, caramels and other sweets, and popularly known as nickel-in-the-slot or penny-in-the-slot machines, at railway stations, hotels, seaside or other places of public resort. They are variedly arranged, but the usual device is that when the would-be purchaser of the commodity or commodities offered for sale drops a coin into the slot and turns

a handle the commodity is released and the coin falls into a receptacle, to be afterwards collected by the vendor's agent. Somewhat similar contrivances also are in use as weighing-machines, a pointer indicating the weight of the person, who, after dropping a coin in the slot, steps on the machine-platform to be weighed.

Sloth, any one of a group of sluggish mammals living on trees in the forests of Central and South America. Their limbs end in hook-like claws, and they are the most strictly tree-inhabiting of all animals. They usually cling to branches with their backs downward. They crawl with difficulty on the ground and rarely descend to it. They are covered with long, coarse hair, the shafts of which are roughened or fluted. This hair is naturally grayish, but in the damp forest it is covered with a growth of algæ, imparting a peculiar green color which makes the animal difficult to distinguish among the foliage. The algæ disappear in a dry climate, and the hair resumes its natural color. They feed upon leaves, young shoots and fruit. They are silent, inoffensive animals and move mostly at night. About ten species are known. Fossil sloths of colossal size have been found in the rocks.

Sloyd. In Sweden *sloyd* or *slöjd* originally meant any kind of trade. In 1872 the Swedish government perceived that, owing to the spreading of the factory-system, *hem-sloyd* or the home industries of the people was declining, and it therefore sent men round the country to lecture upon these industries. At the same time the Nääs school was established by Otto Salomon to give children training in these trades. In this school the educational value of sloyd was recognized, and in consequence the Swedish government introduced sloyd into the public schools as "a system of educational manual-training in which wood is the material employed." The term has still further changed its meaning, for in the Swedish exhibit of sloyd in the St. Louis Exposition of 1904, cardboard and metal-working was exhibited. The Nääs school now is a government institution, the *Slöjdlärareseminarium*, which should be translated simply *Manual-Training College*. When sloyd was introduced to America in 1886, we were still partly under the influence of the Russian idea of manual training, which emphasized the analysis of constructive manual processes into successive steps, each of which was more or less distinct and separate, so that attention and interest were turned rather to the making than to the thing made Sloyd, on the other hand, had come to emphasize the appeal to the creative and esthetic impulses, through the selection of simple objects to be made, which should be of use to the maker or to his friends. This utility was intended to awaken interest in the object made and to furnish a test by which the child making it could judge of its perfection. Further, the sloyd system graded the exercises according to the development of the mind and body of the child, and not according to the order which prevails in training an apprentice whose powers already are developed in larger measure. The Russian system dealt largely with straight lines, especially in the elementary steps; but sloyd, by using the knife as the fundamental tool, was able to begin with curves and with carved work. Sloyd-instruction was individual. In drawing it insisted on drawing from objects rather than from plane-copies. It was adopted in Springfield, Mass., in 1886, in the New York schools in 1888. The Sloyd Training-School was started at Boston as a private institution in the latter year. Until 1896 sloyd was discussed at most meetings of the National Educational Association. A good series of models and outlines of sloyd courses is given in the proceedings of the N. E. A. for 1894, pp. 267-8. But, later, it was apparent that the American idea of manual training so naturally leads to the adoption of the sloyd principles that there was no reason to speak of it as a separate system. As above pointed out, the sloyd methods have also been so modified as to approximate the broader system of manual training which now prevails in this country The influence of the sloyd movement was undoubtedly needed at the time it was felt. See MANUAL TRAINING.

Slug, a land-snail of elongated form, with a small rudimentary shell, either covering the lungs and heart or entirely absent. These animals have feelers with eyes at the extremities, as in the common snail, but the body is not coiled. The shell when present is a small flattened plate usually concealed in the mantle. Some of the common forms reach in length from two to four inches. They often live in cellars. They live concealed under boards and other objects during the day, but are active at night, feeding mainly on vegetables. In Europe they have caused great injury to garden crops. They hide their eggs cunningly in the roots of plants, in crevices and in protected nooks; they would multiply alarmingly if it were not for bird-enemies and an insect that destroys their eggs. The name is applied also to larvæ, as the rose-slug, the larva of a saw-fly, and to various soft-bodied insects.

Smell, the sense that perceives odors. The nerves of smell are an extension of the brain, and are unaffected by any other sort of impression. From the olfactory lobes of the brain they are distributed to the upper part of the nose. The odorous matter is dissolved in the mucous membrane of

the nasal cavity, and if the odor is to be noticed there must be a passage of air through the nose and the membrane must be moist. If one stops breathing, odors can not be noticed. The delicacy of this sense is remarkable; for one thirty-three-millionth of a grain of musk can be detected. When an odor acts on a nerve of smell, it first stimulates it; but if the influence continues long, the stimulus ceases and the nerve ceases to distinguish the smell. The strength or sensitiveness of the sense of smell varies with different animals. In some animals, as the dog, it is wonderfully developed, but in man it often demands confirmation from other senses. Flesh-eating animals are more sensitive to the odor of other animals than are animals that live on vegetation; and these are more sensitive than those to the odor of plants. Only gaseous or vaporous odors are recognized. Some people are so sensitive to odors that roses, new-mown hay or goldenrod inflames the passages of the throat, nose and eyes, causing rose-fever or hay-fever.

Smelt, a small fish closely related to the salmon, but usually placed in a distinct family. On the American Atlantic coast two species, one more northern than the other, extend from the Arctic to Virginia. They are each about 12 inches long and silvery in color. When fresh, they have an odor resembling cucumbers and are highly prized as food. Other similar forms occur in Europe and along the Pacific coast of the United States.

Smiles, Samuel, a Scottish writer, was born at Haddington in 1812. He studied medicine at Edinburgh and practiced at Haddington and at Leeds, finally becoming editor of the Leeds *Times*. Here he met George Stephenson, which led to writing his life in 1857. His book, *Self-Help*, followed, and at once was a success, which has continued, the sales reaching 150,000 copies and the translations being made in 17 languages. Some of his other works are *Character, Thrift, Duty, Lives of the Engineers, Men of Invention, The Huguenots in France, The Huguenots in England* and *Industrial Biography*. He died at London on April 17, 1904.

Smith, Adam, a Scottish philosopher, was born at Kirkcaldy in Fifeshire, on June 5, 1723. He studied at Glasgow and at Oxford, and was made professor in the University of Glasgow. He published his *Theory of Moral Sentiments* in 1759 and, later, a *Dissertation on the Origin of Languages*, both of which had great vogue in their day. But the work which gives him his reputation and makes him the founder of the science of political economy was his *Inquiry into the Nature and Causes of the Wealth of Nations*, published in 1776. Its clear style, startling doctrines and curious facts made it popular at first; but, when it was seen how contrary its principles were to the old ideas of things, it was vigorously opposed. After the French Revolution and the excitement attending it had passed by, the book became the leader of a great host of literary works based upon it. Smith became lord-rector of Glasgow university in 1787, and died at Edinburgh, July 17, 1790. Consult Farrer's *Life* in the English Philosophers Series and Haldane's in the Great Writers Series.

Smith College, at Northampton, Mass., was founded in 1871 by Miss Sophia Smith, of Hatfield, Mass., who donated about $365,000 for the purpose. It is a college for women, providing courses of study and facilities for education equal to those which are afforded in the best colleges for young men. It stands in the first rank among colleges for women. It has a faculty of 165 and an attendance of 1,708 students, with a library of 49,000 volumes.

Smith, Edmund Kirby, a Confederate general, was born at St. Augustine, Fla., in 1824. He was professor at West Point and a major in the United States army. In the Confederate service he became lieutenant-general in 1862 and general in 1864. He was made commander of the trans-Mississippi department in 1863, and so managed it as to make it self-supporting. He invested Cincinnati in the autumn of 1863, but withdrew when the veterans under Sigel entered the city. At the close of the war his forces were the last to surrender. He was president of the Atlantic and Pacific Telegraph Company from 1866 to 1868, chancellor of the University of Nashville from 1870 to 1875, and afterwards professor in the University of the South at Suwanee, Tenn. He died there on March 28, 1893.

Smith, Francis Hopkinson, American artist and author, was born at Baltimore, Md., Oct. 23, 1838, and as a youth studied, and for some years was actively engaged in, mechanical engineering. In the latter capacity he performed considerable work under contract for the United States government. Mr. Smith, however, made his chief reputation as a water-color painter, among his more notable pictures being *In Darlink Wood, In the North Woods* and *A January Thaw*. In literature he also achieved a wide reputation, as well as an illustrator. Among his works are *Old Lines in New Black and White; A White Umbrella in Mexico; Colonel Carter of Cartersville; American Illustrators; Venice; Gondola Days;* and many more. He died April 7, 1915.

Smith, Gold'win, an English scholar and writer, was born at Reading, Aug. 13, 1823. He studied at Eton and Oxford and was elected a fellow of University College. From 1858 to 1866 he was professor of history at Oxford. During the Civil War in the United States he wrote pamphlets in support of

the north, and in 1864 lectured in the United States. He was appointed professor of English and constitutional history at Cornell University in 1868. Since 1871 he has lived in Canada, where he edited the *Canadian Monthly* and founded and edited *The Week* and *The Bystander*. His writings, which are marked by vigorous thought, incisive and brilliant style, remarkable powers of compressing much into little space, great lucidity and high interest, embrace *Irish History; Lectures on the Study of History; Three English Statesmen; The United States* (1492–1871); *The United Kingdom;* biographies of *Garrison, Cowper* and *Jane Austen;* and numerous other works. He died June 7, 1910.

GOLDWIN SMITH

Smith, Henry Boynton, an American theologian, was born at Portland, Me., in 1815. He studied at Halle and at Berlin, Germany, after finishing his theological studies at Andover and at Bangor. He was a professor of philosophy at Amherst College, and of church-history and, later, of theology at Union Theological Seminary in New York City. He held this position 20 years, which, with translations of works on church-history, made him one of the first theologians of the Presbyterian church. He died at New York, Feb. 7, 1877.

Smith, Captain **John,** the founder of Virginia, was born in Lincolnshire, England, in 1580. He traveled in France and the Low Countries, and, when on his way to join the Christian army fighting against the Turks in Hungary, was robbed by four adventurers. He joined a ship, half merchant and half pirate, and helped to capture a Venetian argosy. He distinguished himself in the service of Ferdinand, Duke of Austria; was next sold as a slave; but escaped and traveled through Germany, France, Spain and Morocco. In 1605 he joined an expedition of three vessels and 105 men, to found a colony in Virginia. On the way out he was accused, by the leaders, of a conspiracy to make himself king of Virginia and was kept a prisoner on the voyage. Jamestown was founded on James River in April, 1607. Smith, after being tried and acquitted, was made a member of the council, and was the real head of the colony, saving it from destruction. On one of his journeys into the country for corn he was captured by the Indians under Powhatan, their chief, and his life saved by Pocahontas, the chief's daughter. The story, however, has been doubted by late writers. On his return to Jamestown he found the colony reduced to about 40 men, who were anxious to return to England, but were induced by Smith to remain until others arrived. He explored Chesapeake Bay in two voyages, traveling about 3,000 miles and making a map of the country. He was superseded in 1609 as governor by Lord Delaware, and returned to England. In 1614 he explored the coasts of New England, making a map of the country, which he presented to Prince Charles. He undertook the founding of a colony in New England in 1615, but his vessel was captured by a French war-ship, and he was carried to La Rochelle. After his escape he wrote an account of his voyages to New England. He also wrote *General Historie of Virginia, New England and the Summer Isles* and the *True Travels, Adventures and Observations of Captain John Smith.* Consult *Life* in Sparks' "American Biography." He died at London, June 21, 1631. See POCAHONTAS.

Smith, Joseph, Jr. See MORMONS.

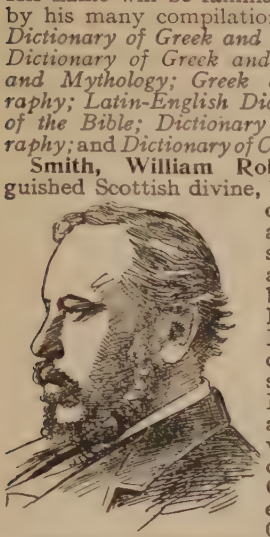
Smith, Samuel Francis, an American clergyman, was born at Boston, Mass., in 1808. He served as pastor of Baptist churches in Waterville, Me., Newton and Boston, Mass., and edited *The Christian Review* and other Baptist periodicals. He is known as the author of several hymns, but especially of the national hymn, *My Country 'tis of Thee,* which he wrote in 1832, while a theological student at Andover. A Baptist hymn-book contains 27 of his hymns. He died on Nov. 16, 1895. Dr. Holmes said of him: "Fate tried to conceal him by naming him Smith, but he shouted a song: *My Country, of Thee.*"

Smith, Syd'ney, an English author, was born at Woodford, Essex, June 3, 1771. He studied at Oxford and was curate at Netheravon where he became tutor to a young man intending to study in Germany, but the war prevented and sent them to Edinburgh. Here, in 1802, with Jeffrey, Horner and Brougham he started *The Edinburgh Review,* writing 18 articles in the first four numbers. He next lived six years in London, where he made his mark as a lecturer on philosophy, a preacher and a brilliant talker. He was made rector of Combe Florey in Somerset and a prebendary at St. Paul's, London. He wrote 65 articles for *The Edinburgh Review; Peter Plymley's Letters* in favor of Catholic emancipation; and letters and pamphlets on the ballot, the game-laws, prison abuses etc. He is best known, however, as a wit and the creator of "Mrs. Partington." He died on Feb. 22, 1845. See *Life* by Holland and Reid's *Times of Sydney Smith.*

Smith, Sir **William,** an English classical scholar and for many years editor of *The*

London Quarterly Review, was born at London in 1812 and died on Oct. 7, 1893. His name will be familiar to most students by his many compilations — chiefly by his *Dictionary of Greek and Roman Antiquities; Dictionary of Greek and Roman Biography and Mythology; Greek and Roman Geography; Latin-English Dictionary; Dictionary of the Bible; Dictionary of Christian Biography;* and *Dictionary of Christian Antiquities.*

Smith, William Robertson, a distinguished Scottish divine, biblical scholar and orientalist, was born at Keig, Aberdeenshire, Nov. 8, 1846, and died at Cambridge, England, March 31, 1894. Educated at Aberdeen University, he studied theology at Edinburgh, at Bonn and Göttingen, and was elected to the chair of Hebrew and Old Testament exegesis at the Free Church College, Aberdeen. While here, he contributed articles of an advanced character on the Bible for the *Encyclopædia Britannica* adverse to the "standards" of the Free Church, which provoked much controversy and led to a prosecution for heresy. Owing to a skillful and powerful defense and to the spread of broader views of biblical criticism and of the latitude allowed a writer on questions of interpretation, the trial was inconclusive, though subsequently (in 1881) he was removed from his chair, but left with its emoluments. This occurred in consequence of Professor Smith's later articles for the *Britannica* on the Hebrew language and literature. During his suspension he traveled in Egypt and Arabia, and on his return he became associated with Prof. T. Spencer Baynes in the editorship of the *Britannica.* In 1883 he became lecturer on Arabic at Cambridge and subsequently professor at that university. The works of this fearless investigator and writer embrace *The Old Testament in the Jewish Church, The Prophets of Israel, The Religion of the Semites, Fundamental Institutions, Kinship and Marriage in Early Arabia* and *Isaiah* for Professor Perowne's *Cambridge Bible for Schools.*



WILLIAM ROBERTSON SMITH

Smith, Sir **Will'iam Sid'ney,** the hero of Acre, was born at Westminster, England, July 21, 1764. He entered the navy at 11, and was made lieutenant when only 16 for his courage at Cape St. Vincent. From Constantinople in 1798, learning that Bonaparte was about to attack St. Jean D'Acre, Syria, he hastened there in command of a squadron. He captured the enemy's vessels in March, 1799, and held the town until Napoleon raised the siege, leaving his guns behind. His death occurred at Paris, May 26, 1840. See *Life* by Barrow.

Smith'field or **Smooth'field,** is an open space of nearly six acres in London, England, and has for centuries been used as a market for sheep, horses, cattle and hay. It was outside the city-walls, and could be used for jousts, tournaments and executions. The well-known Bartholomew fair was held here; Wallace the noble Scotch patriot was executed here by Edward I; Wat Tyler, with 30,000 peasants, here met Richard II and was stabbed by the mayor of London. It is best known, however, as the place of execution of the long line of English martyrs from 1401 to 1612. The cattle-market, well-described in *Oliver Twist*, was closed in 1855. The hay-market still occupies part of the space, but the center is laid out as a garden with fountains.

Smithso'nian Institu'tion, a scientific establishment, which was organized by Congress in 1846 to carry into effect the will of James Smithson, an Englishman, born in 1765, who devoted his life to scientific pursuits and bequeathed his estate of $515,169 to the United States, to found "at Washington an establishment for the increase and diffusion of knowledge." The original bequest has, through subsequent additions, reached the amount of $900,000, to the interest upon which Congress adds an annual appropriation of about $20,000. The institution is governed by a board of regents appointed by the government. It has large and beautiful buildings, filled mainly with the national collections. The principal work of the institution is in the direction of original research, Professor Henry, the first secretary, making the rule that nothing should be undertaken by it which could be done as well somewhere else. Its library of 100,000 volumes has been united with that of Congress, and its art-collection was transferred to Corcoran Art-Gallery. In its buildings are the national museum, a bureau of ethnology and a bureau of international exchange; and connected with it are a national park and an observatory. It publishes *Smithsonian Contributions to Knowledge, Miscellaneous Collections* and an annual report. It carries on communication between the library and scientific associations in Europe and America, and has a vast correspondence with all parts of the world.

Smoke, the vapor produced by burning any substance, usually wood or coal. The smoke from burning wood is almost colorless, and consists mainly of carbonic acid and water, while that from burning bituminous coal is darker, being mixed with an oily vapor and soot or finely divided carbon. The more perfect the combustion, the less smoke; and the great effort in large

cities to remove the smoky atmosphere which results from the large amount of smoke coming from factories, foundries and innumerable fires is mainly in the direction of perfecting the combustion of the coal used. If coal is heated in a close vessel, the oil, tar and gas formed in the combustion are all driven off consumed, leaving a coke which burns with a smokeless flame, as does also anthracite, which has lost the original volatile matter of the coal by natural processes.

Smoll'ett, Tobias George, a Scotch historian and novelist, was born at Dalquhurn, in 1721. He studied medicine and served an apprenticeship with a doctor and apothecary, afterwards obtaining a medical degree. He went to London in 1739 and attempted to stage his tragedy of *The Regicide*, but failed, and went as surgeon's mate on *The Cumberland*, which took part in the expedition to Carthagena in 1741. Both these experiences he describes in *Roderick Random*. His first publication was *Advice, a Satire*, in 1746. *Roderick Random* appeared in 1748 without his name, and was a great success, as was also the *Adventures of Peregrine Pickle* in 1751. His *History of England* from the invasion of Julius Cæsar to 1748 was begun in 1756, four volumes being written in 14 months. The continuation of the history, bringing it down to 1764, is better known than the first part, forming the continuation of Hume's history. His *Travels through France and Italy* were written after a two years' sojourn on the Continent. In Monte Novo near Leghorn, Italy, where he had gone for his health, Smollett wrote his last and best novel, *Humphrey Clinker*, which was published in 1771. He lived only long enough to hear the first rumors of its success, dying on Oct. 21, 1771. See Hannay's *Life* in the Great Writers Series.

Smug'gling is bringing goods liable to duty into a country without payment of the government dues; it also is the evasion of taxes on goods by illegal or secret manufacture. Smuggling was carried on largely in early times in England and on the Continent, and the stories of the adventures of those engaged in it form a large part of old romances, as in Scott's *Guy Mannering* and *Redgauntlet*. Tea, brandy, silks and tobacco were the articles brought into England by smuggling, at one period half the silks sold paying no duty and three fourths of the tobacco used in Ireland escaping the tax. The introduction of free trade in England made the business unprofitable. The enormous coast of the United States makes the evasion of custom-duties easy, and the long frontier on Canada and Mexico also offers opportunities of introducing contraband goods; but smuggling is carried on largely through the regular channels of trade and under the eyes of the custom-house inspectors, in spite of very careful watching The schemes for carrying it on are innumerable, women being especially skillful in their evasions. Goods are concealed about the person, as in the hair and in false calves on the legs, in canes and secret pockets and quilted into skirts or vests. Seizures of large amounts are often made, but the hope of success and the profits of one successful venture keep up the practice. The illegal manufacture of spirits has been carried on mainly in the mountainous districts of the south, and the adventures of the revenue-officers in those regions afford considerable material for romance.

Smut (in plants), a common disease of the grains of many cereals, as corn, rye etc., caused by the presence of a parasitic fungus. See ÆCIDIOMYCETES.

Smyrna (*smĕr'nà*), an important seaport in Asiatic Turkey, at the head of the Gulf of Smyrna. The gulf runs inland from the Ægean Sea for 46 miles. The city climbs up the slopes and nestles at the foot of a steep hill, on the summit of which are the ruins of the ancient Greek Acropolis. Its population of 350,000 contains a large Turkish element, though numerous other races are represented. It has manufactures of carpets, cotton and woolen goods, pottery, iron-foundries and machine-shops. Its importance, however, is from its commerce, as it has the largest part of the trade of Asia Minor with Europe. It exports raisins, figs, opium, carpets, sponges, licorice, olive-oil, tobacco, walnut-wood, emery and poppy-seed; and imports cloths, timber, iron, butter, cheese, petroleum, glass and paper. There is a fine harbor, which is entered annually by over 1,600 vessels. Smyrna, originally peopled by Greek immigrants to Asia Minor, became Ionian before 688 B. C., and was one of the great trading-places of the east. The king of Lydia destroyed it in 630 B. C., and it was more than 300 years before it was rebuilt on a new site. Under the Romans it regained its importance, though rivaled by Byzantium, to whose emperors it belonged. Destroyed by Tamerlane in 1402, it was captured by the Turks in 1424.

Snail, a shelled mollusk belonging to the class *Gasteropoda*. The land-snails are widely distributed and well-known. They are air-breathers, and, feeding upon vegetation, do much injury in gardens. The animal is spirally coiled to fit into its shell. The lower part of the body, called the foot, can be protruded. There are four tentacles or feelers on the head, which can be shortened or extended at will. The longest pair have eyes in their tips. There are slender muscles attached to the apex of the shell and to the animal's foot, by means of which the animal is drawn into its shell. In dry weather or in winter the opening is often

closed by a horny structure, called the *operculum*. There are an immense number of land-snails in tropical countries, of considerable size and bright colors. Some are tree-climbers and secrete a thread of mucous substance, by means of which the body is suspended like that of a spider by its thread. They are eaten as food, especially in Europe. There also are water-snails, some of which come to the surface to breathe air, while others are provided with gills. The common garden-snail has 135 rows of 105 teeth each, making 14,175 in all.

Snake River, the largest branch of the Columbia. It rises among the Rocky Mountains near Wyoming, and in crossing southern Idaho forms Shoshone Falls, and is a part of the northern boundary of Idaho. In southern Washington, as Lewis River, it joins the Columbia, having made a journey of 1,050 miles. It is navigable for only 160 miles.

Snakes, the largest class of reptiles, the representatives having an elongated body covered with scales. They have no limbs and no rudimentary bones representing the shoulder-arch, but there is a trace of the arch of the hind limbs. They move by pushing the edges of the ventral scales against roughnesses, but can make no headway on a smooth surface. The bones of the skull and jaws are movable, so that the latter can be put on a stretch, which enables the snake to swallow animals larger than the normal size of the mouth and throat. Some possess poison-fangs with which their prey is killed, while others coil around their prey and crush it. They shed their skins periodically, and the deserted skins are often seen in fields and woods. Some live entirely on land, though most snakes swim well, others climb trees, and in the Indian Ocean are snakes living habitually in the water. Most of them lay eggs, but a few, including the last-mentioned ones, bring forth their young alive. The snakes naturally fall into two groups — the nonpoisonous and the poisonous ones. There are about 700 species of nonpoisonous or colubrine snakes, which are found in nearly all parts of the world. They are well-represented in the United States, and include such familiar forms as garter-snakes, blue racers, grass-snakes and blow-adders, all of which are harmless. The venomous snakes are represented in the United States by the rattlesnake family. There are about 60 species in this family, all American and renowned for their venom. Besides rattlers are included the copperhead and water-moccasin, the latter being the most dangerous of our snakes. The anacondas, boas and the like are powerful nonpoisonous snakes. All snakes are more abundant in warm and tropical countries. India is noted for venomous snakes, like the cobra, and the annual number of deaths from snake-bites there reaches nearly 25,000. See Boa, Cobra, Copperhead, Mocassin and Rattlesnake.

Snipe, a common name for a number of favorite game-birds belonging to a group of

SNIPE

shore-birds. They grade into the sandpipers. There are about 100 species, and 30 of these visit the United States mainly during migration. A number of snipes, however, nest within the United States. Among the more widely known forms are the woodcock, jack-snipe, tip-up and Wilson's snipe. The jack-snipe is the pectoral sandpiper, and the tip-up the spotted sandpiper. The American woodcock is about 11 inches long, and variegated with black, brown, gray and russet colors. The European woodcock is similar, but considerably larger. The American bird frequents low, wet woods and in the autumn visits corn-fields and wooded hillsides. They probe for earthworms with their long bills, making holes in clusters. Wilson's snipe is about 11 and one fourth inches long, and is a favorite game-bird. It lives in fresh-water marshes and meadows. The tip-up or teter snipe is about seven and one half inches long, and has a white breast spotted with black. The jack-snipe is abundant during migrations. Snipes also abound in the Old World.

Snow is water floating in the atmosphere in a crystallized state. When a cloud of water-vapor reaches a temperature below 0° C., the process of freezing begins; and, if the air be calm, the crystals thus formed are large and regular. They are most easily observed by collecting them on a piece of black velvet and examining them with a lens. In the accompanying figure are shown the forms of some typical crystals, recently prepared from microphotographs by the United States Weather-Bureau. The whiteness of snow results from the total reflection of light, which occurs, sooner or later, when a ray of light enters any considerable body of snow from any direction. By the *snow-line*, sometimes called limit of per-

petual snow, is meant the height above the sea at which snow does not melt, even in the hottest summers. This elevation varies greatly with latitude and with local circumstances. In general it diminishes with the latitude. The lower the latitude, the higher the snow-line. Snow does not, however, collect to an indefinitely great depth, even in regions which lie entirely above the snow-line; for the pressure soon reaches a point where the snow is compressed into ice and flows off as a glacier. Consult Tyndall's

Forms of Water (International Scientific Series.)

Snow'berry, a common shrub, native of North America, belonging to the honeysuckle family. It receives its name from its white, waxy berries, which remain on the bush after the leaves have fallen and make it an ornamental shrub.

Snow'bird or **Jun'co,** a sparrow-like bird very common in the United States during winter. They are about six and one half inches long, with the upper parts slate-gray and the lower parts whitish. They are often seen in flocks of ten to 50 on the ground near evergreens. They nest north of New England.

Snow-Bound, a poem by Whittier, was written, as he said, "to beguile the weariness of the sick-chamber." It was published in 1866. It is the best idyl of American rural life, delicate, spontaneous and true to nature and life. It pictures an old-fashioned American farm-home, simple, frugal and devout. A warmth of affectionate memory and religious faith permeates it; the lines on the death of the poet's sister are superb in beauty and pathos. The incidents of household-life and the unity and interdependence of a New England rural family in winter are so skillfully portrayed as to rank the poem with *The Cottar's Saturday Night* and *The Deserted Village.*

Snow'bunt'ing or **Snow'flake,** a bird about seven inches long, nesting in the far north and, in winter, visiting the United States as far south as Ohio River. In the breeding-season they are pure white, with black on their wings and tail and black feet and bill. The winter-plumage changes, and the white on the body is clouded with clear, warm brown, and the bill becomes pale. They appear in flocks on the ground

SNOWBUNTING

and perch on fences, but rarely on trees. With the snow-birds they belong to the finch family.

Snow'drop, a class of plants of the same order as the amaryllis. It is a spring-flower, with a white, drooping bell which gives its name, from its resemblance to a lady's earrings, or drops, as they were called in the 16th century. The root — a bulb — has two or three narrow leaves and a long stem with a single flower.

Snow'shoes, very broad, flat shoes, used in cold countries for walking on snow. The broad surface keeps the foot from sinking into the snow. The snowshoe worn in Canada is shaped somewhat like a tennis-racket, with a short handle, and is from three to five feet long and from one to two wide. It is a wooden frame with a leather covering, upon which the foot is fastened by thongs. The Norwegian snow-shoe, called *ski,* is a wooden runner, about four inches wide and eight feet long, turning up in front.

Soap is a compound of soda or potash and fat, potash making a soft soap and soda a hard soap. The principal fats used are tallow, lard, olive-oil and cocoanut-oil for hard soaps; besides these, linseed-oil, fish-oil and castor-oil are used in soft soaps. The distinctive property of soap is its power of cleansing, though to what it owes this power has never been decided. It will dissolve in water and in alcohol, and, when shaken in water forms a foam or lather. Soap is made by boiling the fat or oil with a solution of soda or potash, the length of time and the strength of the solution or lye varying with the kind of soap. Yellow soap usually contains rosin Toilet-soaps are made of good yellow or curd soap, the finest being subjected to a process called milling. The soap is cut into shavings, dried a little, coloring matter and perfumes added, and then passed between granite rollers and afterward pressed into bars, from which the cakes are cut and stamped.

Transparent soaps are made by dissolving common soap in alcohol, pouring off the solution and getting rid of the most of the alcohol by distillation. Soap improves with age, growing harder and dissolving more slowly.

Soapstone. See TALC.

Sobieski, John. See JOHN III OF POLAND.

So'cialism is the theory that society should be reconstructed. The state, it holds, should own all property except wages, clothing, food, fuel and homes; direct if not operate all industries; and distribute the profits to all citizens. Socialism is neither communism nor anarchy, and does not oppose religion or the family, though many socialists do. It originated in 1808, its founders being Fourier and Saint-Simon in France, Robert Owen in England (1817) and Lassalle and Marx (1867) in Germany. The socialist movements of Saint-Simon, Owen and Blanc collapsed in 1848, but "Christian socialism" then originated in England with Maurice, Ludlow and Kingsley, the famous author of *Yeast*. Lassalle (1863) founded democratic socialism, called social democracy, and Marx created modern socialism. Though this now differs as to details and methods from his extreme views, it agrees on the whole with his principles, which are these:

Land and capital are the sources of subsistence and instruments of production. Labor gives them value. They should belong, not to individuals, but to society. Capitalists, people who possess wealth but do not labor, own land and capital and hire labor. The laborer must live. He has only his labor to sell for his support. So he is not free, really, but a kind of slave. Capitalists pay only enough to support him and his family, the future laborers, but take the value that he gives to property and products. This value belongs to the laborer, and should be paid to him. The state, therefore, ought to manage all industries and distribute their profits. Socialism claims that when this is done, society will be perfect, prosperity permanent and universal. It is gaining ground in Europe and Australasia. It aims to gain control of all governments by peaceful political action. See SYNDICALISM.

Social' Set'tlements. A social settlement is a group of people who have what is commonly called education and social training living among those who through poverty have less of those things, for the purpose of learning from them and of them, while teaching and helping in whatever way is possible. The benefits thus conferred on each class should also lead to the breaking down of class-distinctions. Inspired by Kingsley, Maurice and Ruskin, Arnold Toynbee, a tutor of Oxford University, in 1875 founded in Whitechapel, London, the first settlement. After a few years he died, but in 1884 Toynbee Hall was established in that part of London, where he had worked. In 1887 Stanton Coit, who had written *The Neighborhood Guild*, founded a club of that name in New York City, which embodied Toynbee's plans. In 1889 Hull House, the most famous of our social settlements, was established in Chicago under the direction of Jane Addams and Ellen C. Starr. Since then the movement has spread to all the chief cities of this country. In 1907 two splendidly equipped buildings were dedicated to this purpose: University House in Philadelphia and Pillsbury Building in Minneapolis, bearing witness to the continued life of the idea. There were, in 1905, more than 115 settlements in the United States, of which 30 were in New York City, 15 in Chicago, 14 in Boston and 5 in Philadelphia. About 100,000 people were connected in some way with the work of these settlements, and nearly that number were registered in the various classes conducted by them. In England there were 14 settlements in London conducted by and for men and the same number for the benefit of women. There were about 50 in Great Britain. There are a few settlements on the European Continent and in the colonies. The largest settlements are University Settlement in New York with 10,000 attending; Hull House with 6,000; and Kingsley House in Pittsburg with 6,000. In America the activity of the women in this work is very marked; in England the university men have led the way, but recently university women have done much work. In both countries it is chiefly college students or graduates who engage in settlement work.

The work centers around the persons of the few who reside in the settlement. There always are many nonresident helpers. The residents usually pay all their own expenses, except in the case of one or two officers. The residents visit their neighbors, and help with comfort and advice, but do not give money, as a rule. In the evening men and women gather in the reading and smoking parlors, and amuse themselves in various ways. Debating and dramatic clubs are popular. Of importance are the organizations conducted by the members. So far as possible in the best settlements the management is given over to such organizations, who have to settle many problems in their business meetings. Gymnastics and athletic clubs are popular, and sometimes dancing associations among the women. There are many lecture-courses and musical entertainments. Evening classes in which courses of study may be steadily pursued are also offered. Special features distinguish some settlements.

For example, dispensaries, employment bureaus and legal aid societies. Special investigations have been conducted, particularly in connection with Hull House; for example, as to the cause of an epidemic disease; and the results have proved of much value. In this work the association with university courses in sociology is often of service. The settlements have assisted the juvenile courts now being established throughout the country. In all things the atmosphere of brotherhood and democracy is to displace the spirit of envy, contempt and condescension and fear which class-distinctions tend to cause. See Emil Muensterberg, in *Charities and Commons*, Sept. 14, 1907.

Soci'ety Islands, a group in Oceania or the eastern Pacific Ocean, lying to the south of the Hawaiian group, divided into several groups, the Tahiti Islands and Society Islands proper being the chief, with the Marquesas Islands, the Leeward Islands, the Tuamotu and other groups. The Tahiti and adjoining groups belong to the French and consist of a number of islands. They are of volcanic origin and mountainous, the loftiest point on Tahiti being 7,339 feet high. These islands are governed by a French administrative council Their area is 1,520 square miles and their population about 29,000, mostly Polynesians — all forming a homogeneous colony. They have a healthful and mild climate and fertile soil, producing the guava, breadfruit, oranges, lemons and other tropical fruits. The chief industries are the preparation of copra, sugar and rum, which, with vanilla and mother-of-pearl, form the chief exports. Pigs, dogs and rats were the only animals found on the islands when discovered, but all domestic animals have since been introduced. The Spanish and English both claim the discovery of the islands, Captain Cook in 1760 giving them their name. Through the labors of English missionaries the islands, then under Queen Pomare, were Christianized in 1815. The efforts of French Roman Catholic priests to enter the country brought on a dispute with England and the final establishment ot the French authority on Tahiti. Steamers connect the islands with San Francisco and New Zealand. Consult Hort's *Tahiti* and Gaffarel's *Les Colonies Francaises.*

So'ciol'ogy. The first writer to attempt a special differentiation of this science was the French philosopher, Comte (1789–1857). He conceived that the phenomena of social intercourse are subject to natural laws as definite and unvarying as those of physics or physiology. The study of these laws, or sociology, he regarded as the goal of scientific research. All sciences exist to prepare the way for the sociologist. Biology, the science of life, is the study upon which sociology, in his view, is most immediately dependent. Comte (*q. v.*) hoped from this new science to discover the principles that should be employed in regenerating society. Theoretical study thus led to immediate practice in a utopian scheme of social life. Herbert Spencer (1820–1903), the English philosopher, did much toward making sociology a science. With him the biological conception is dominant, and his two leading principles are that of evolution (*q. v.*) and the notion that society is an organism, the evolution of which involves the progressive differentiation of organs and functions and their integration into a harmonious system. Bastian, the German ethnologist, endeavored to found sociology upon psychology. He studied the effect of external conditions upon the mind, and from these effects deduced the explanation of the social relations devised by the intelligence of man.

In recent times sociology has developed into a recognized science with regular departments in many universities. It may be divided into pure and applied sociology. Pure sociology considers the general laws governing the genesis and evolution of society and the effect of social intercourse upon the character of the individual. It is especially dependent upon history, anthropology and statistics for its facts and upon psychology for its explanations. From history, political science and economics it gets an account of the institutional and industrial relations that prevail and have prevailed since civilization became well-established. From anthropology it gets an account of the social traits of primitive men and of the beginning of morality, law, religion, the arts and institutions, the family, the state and social orders. From psychology it gets the laws of social suggestion, imitation and the effects of these on different temperaments. The most important authorities on imitation are Tarde, the French writer, and J. M. Baldwin, the American psychologist. Tarde regards all social intercourse as based primarily upon imitation. Inasmuch, however, as each individual may strive to imitate many models, the result will be a composite in which some models are suppressed and others fused into a new product. Meanwhile the uses of practical life will continually act as a force determining which models shall be preserved and which shall disappear. The social mind is a product of certain inherent powers stirred into life and molded by the influence of imitation. Baldwin especially shows how the intellectual and moral life of the individual is awakened and given content by this activity. Le Bon, a French writer, sets forth the peculiar laws that govern the action of the individual when in a crowd and the effect of social characteristics upon the operation of such

social forces as imitation and suggestion. Prominent present-day sociologists, while attaching great importance to imitation, do not by any means make it account for all social phenomena.

Applied sociology does not to-day concern itself so much with an attempt at an utopian reconstruction of society as with the best policy in dealing with those in whose affairs society, either for its own good or for philanthropic reasons, feels called upon to interfere. Both criminology and philanthropy are becoming important specialized sciences, and a distinct School of Philanthropy now exists in New York City. Consult Giddings's *Elements of Sociology* and Henderson's *Dependents, Defectives and Delinquents.*

Socrates (*sŏk'rā-tēz*), a Greek philosopher, was probably born in 469 B. C., near Athens. His father was a sculptor, and he is said to have been trained in the same art, and a statue of the Graces at the entrance to the Acropolis was thought to be his work. He served in the army in three campaigns, where his bravery and endurance were praised by his friends. In 406 B. C. he was a member of the senate of 500, and refused, at risk to himself, to put an illegal question to vote. He was short and odd-looking, with a flat nose, thick lips and prominent eyes. He practiced plain living and trained himself to be indifferent to heat and cold, going barefoot and wearing the same clothing the year round. Xantippe, his wife, has been pictured as a scold, and he professed that he married her as a means of discipline. But a reformer is not always the most pleasant companion and the habits of Socrates must have been at least somewhat trying to an orderly woman.

In middle life he devoted himself to the career that has made his name forever famous. He established no school and did not call himself a teacher, but frequented the public walks, the gymnasia for bodily training, the schools and the market places, talking with any one that addressed him, in the hearing of the bystanders. He had, strictly, no disciples, though some persons made a habit of being present at his conversations. As Socrates left no writings, it is from Xenophon and Plato, two of these friends and listeners, that we have the accounts of his teachings, though in Plato's writings it is difficult to tell what part of the reported conversations are the words of Socrates and what part Plato himself put into his mouth. Socrates believed that he had a special religious mission, having learned from the Delphic oracle that there was no wiser man than himself and interpreting it to mean that the highest wisdom was to be conscious of ignorance and that it was his duty, by questioning all men, to make them wise by teaching them their ignorance. The subjects of his conversations were human nature, human duties, human relations and human happiness, as being the most practical and necessary to man. Cicero said: "Socrates called down philosophy from the heavens to earth and introduced it into the cities and houses of men." In 399 B. C. an indictment was laid against Socrates "for not worshiping the gods whom the city worships and for introducing new divinities of his own; next, for corrupting the youth." Plato's *Apology* gives the substance of his defense, a vindication of his whole life, but not given in a way to conciliate the jury of over 500 Athenian citizens. The vote of condemnation was carried by a small majority, though the sentence of death by poisoning was passed by 80 more votes, provoked probably by his apparent indifference to their judgment. The execution of the sentence was delayed 30 days. Socrates, refusing to escape as his friends urged him to do, spent his last day in discoursing on the immortality of the soul. In the evening he drank the hemlock, and, still talking to his friends, calmly watched the poison doing its appointed work. "Such was the end," says Phædo, "of our friend, whom I may truly call the wisest, justest and best of all the men I have ever known." Consult Zeller's *History of Greek Philosophy.* See PHILOSOPHY, PLATO and XENOPHON.

So'da is a compound of sodium and oxygen, the oxide of sodium, sometimes called a mineral alkali. With acids it forms what are known as soda-salts. The soda of commerce is one of these salts, a compound of soda and carbonic acid, and is called sodium-carbonate, carbonate of soda or sal-soda. It is in large crystals, which dissolve in water and turn to powder in the air. It is sometimes found as a white powder on the top of the ground on the alkali-plains of the west and also in the nitrate lakes of Hungary and Austria and in springs in Iceland and North America. It is manufactured largely from sea-salt, and has been obtained from the ashes of sea-plants. It is used in washing and in making Soap. The soda used in cooking is usually the bicarbonate of soda. It is prepared by adding carbonic-acid gas to the carbonate of soda in different ways, sometimes making a solution of the soda and saturating it with the gas; or by sending a current of the gas over the crystals of soda; or by a chemical process which takes place when common salt, carbon-dioxide and ammonia are brought together. Caustic soda is made by mixing milk of lime, which is slaked lime stirred up with water, with a solution of carbonate of soda, filtering and evaporating the liquid to dryness. This is used in soap-making and in many chemical industries. There are many other sodium or soda salts, as the sulphate, called Glauber's

salts, the phosphate, the nitrate and soldiumchloride or common salt (*q. v.*).

Sodium (*sō' dĭ-ŭm*) is a metal very much like potassium, of a bluish-white color, and burning with a yellow flame. The compounds of sodium are the only form in which it is found in nature, as borax sodafelspar and, especially, chloride of sodium, which is common salt.

Sod'om and Gomor'rah, two cities mentioned in the Bible and thought to be on the southern shore of the Dead Sea. The Scripture account represents them as being destroyed by a shower of fire for the great wickedness of these cities, and the popular belief has assumed that the waters of the Dead Sea cover their sites.

Sofia (*sō' fē-yȧ*), the capital of Bulgaria since 1878, stands in a valley of the Balkans. It has been improved since 1891, the old Turkish city with its tumbledown houses and crooked streets being replaced by new French houses, wide boulevards, fine public buildings and electric lights. Railroads connect it with Vienna, Constantinople and Belgrade. It is the seat of the National University, which supports three faculties of 49 professors and lecturers and has about 800 students. The city also has a free library. Its trade is mainly in corn, hides and wheat. Its hot mineral springs have been celebrated for centuries. Sofia was known as *Serdica* by the Romans, and was the seat of a famous council in 343. It belonged to the Bulgarians from the 9th century until 1382, when it was captured by the Turks. In 1878 it was occupied by Russia. Population 102,769.

Soils, the different forms of earth on the surface of the rocks, formed by the breaking down or weathering of rocks. The soils will vary with the minerals in the rocks, the principle ones being quartz, felspar, clays, mica and limestone. When the soil is made from the rocks in their original position, they are called sedimentary; but if formed from rocks above them and carried to them, they are known as transported soils. When the soil is carried by glaciers, it forms drift soils; when carried by running water, it is known as alluvial soil. They are also known as clays, loams, etc. Plants also make soil by their decay. So do animals, especially earthworms (*q. v.*). A mixed soil or loam is usually better than a clay or a sandy soil. The plants grown in the soil take from it from 200 to 600 pounds per acre yearly of the minerals found in it, and the passage of water through it also carries away other quantities, so that, where crops are removed, the soil would gradually lose its power of supporting plant life, were it not enriched. This is done naturally by the gradual decomposition of the minerals composing the soil, and also by the artificial process of applying manures and other fertilizers. Another mode of overcoming the difficulty to some extent is by changing the crops grown, as different kinds of crops take up the ingredients of the soil in different proportions. Agricultural scientists are constantly studying soils. See AGRICULTURE, FERTILIZERS, MANURE and NITROGEN-GATHERING CROPS. Consult the Department of Agriculture Experiment-Station's *Bulletin 106*; the Soil-Bureau's *Publications;* the Weather Bureau's *Bulletins 3, 4* and *5*; Frea..: *Soils;* King: *The Soil;* Roberts: *Fertility of Land;* and Shaler: *Origin of Soils* (in U. S. Geological Survey's *12th Annual Report*, 1890-1, Vol. One, pp. 213-45).

Sokoto (*sō'kō-tō*) is a Sudanese province of Northern Nigeria in Central Africa. It lies between Bornu on the east, Gandu on the west, Benue River on the south and the Sahara on the north, and has an area of 200,000 square miles and a population of possibly 12,000,000. The Fulahs are the ruling race, the Hausas and other Negro tribes the subject population. The sultan in 1885 put his kingdom under British protection, granted the Niger Company a monopoly of trade, and afterward received a resident. The country is fertile and well-watered, and has extensive deposits of excellent iron. The people are intelligent, industrious and peaceful, good farmers, great traders and manufacturers of iron-work, muslin and shoes. Sokoto the capital is a city of 80,000, and is well-built in the Moorish style.

So'lar Mi'croscope, a modified form of magic-lantern, not much used now that gas-lanterns and electric lanterns have become so easily available. The only essential difference between the solar microscope and the ordinary magic-lantern is that in the former a beam of sunlight, reflected from a heliostat or porti-lumiere, is employed instead of oil, gas or the electric arc for illuminating the slide.

Solar Sys'tem a term used in astronomy to include the sun, planets, satellites of planets, asteroids and any "captured" bodies, as possibly periodic comets. See ASTEROID, ASTRONOMY, MOON, PLANET and SUN.

Sol'emn League and Covenant, The, was a contract entered into by the General Assembly of the Church of Scotland and the Commissioners from the English Parliament in 1643 to secure uniformity of doctrine, worship and discipline throughout Scotland, England and Ireland "according to the word of God and the example of the best reformed churches." By this agreement the Scotch army came to the aid of Parliament in its war against Charles I. On the other hand, Presbyterianism was introduced into England and Ireland. Royalist successes had made Scotch aid indispensable. So the covenant was signed by members of the House of Commons and

Assembly divines who took oath "to labor for the preservation of reformed religion in the church of Scotland and the reformation of religion in the kingdoms of England and Ireland." It formed a bond of union between England and Scotland during the war, but was abjured in both countries by act of Parliament in 1662.

Soldier's Homes in the U. S. These comprise the National Soldier's Home in Washington, D. C., for the maintenance of discharged soldiers and pensioners of the regular army, where they are lodged, fed and clothed without personal cost, and also if sick, medical attendance. The inmates who to-day number about 1,250, are subject, as army soldiers, to the rules and articles of war. Another institution, similarly conducted and with like object, is the National Home for Disabled Volunteer Soldiers (including sailors), with headquarters at New York City and branches at ten other cities and towns, whose aggregate members cared for number about 30,000. Besides these there are state homes for the same class in about 30 states of the Union, the state and town location of each institution being found in current issues of *The World Almanac* and other year-books.

Solferino (*sŏl'fer-ē'nō*), a village of northern Italy, 19 miles from Mantua. It stands on a hill with a high tower, called The Spy of Italy, from which can be seen the whole plain of Lombardy. It is noted as the scene of the defeat of the Austrian forces by the French and Sardinians, June 24, 1859. The battle lasted 16 hours, the Sardinians being commanded by Victor Emmanuel, the French by Napoleon III and the Austrian forces by Emperor Francis Joseph. The Austrian loss was 20,000, and that of the allied troops 18,000. On June 24, 1870, the bones of the dead were collected in the presence of representatives of France, Italy and Austria, and buried in three great sepulchers. Population 1,350.

Sol'omon, the third king of Israel, the son and successor of David. He reigned 40 years, 993–953 B. C., and was famous for wisdom as well as for his splendid court. His father left a large army and a full treasury, which he used in keeping peace with the neighboring nations and in building fine palaces and the temple, the chief glory of his reign. He extended trade, sending out fleets and caravans which brought back gold, gems and precious woods from Ophir and horses for his chariots from Egypt. His great wealth, however, came from heavy taxation, and he built altars for the idols worshiped by his heathen wives, which caused the nation after his death to revolt against his son and ended in the division of the kingdom. The writings that bear his name are the *Proverbs*, *Ecclesiastes* and the *Song of Songs*, though *Ecclesiastes* probably belongs to a much later period.

Solomon's Seal, a species of plants of the lily-family and related to the asparagus. The plant grows from one to four feet high, with broad green leaves, without stems, and drooping, greenish flowers, followed by small black or blue berries. It is found wild in many parts of North America and in Europe.

So'lon, the ancient Greek lawgiver and one of The Seven Wise Men, was born about 638 B. C. Though tracing his descent from the royal family of Attica, he had to resort to trade to restore the wealth his father had squandered. He was known as a writer of verses, one of his finest elegies having been quoted by Demosthenes and several quotations being found in a work of Aristotle's. The beginning of his political career was the Megarian War. The Athenians had several times failed in their efforts to capture Salamis, and had, on pain of death, forbidden any citizen to renew the attempt. Solon, by feigning madness, aroused the people by his poem, and war was declared, with Solon in command, who succeeded in winning Salamis for Athens. He was made archon or chief ruler in 504, when the country was in danger of a conflict between the nobility and the peasants. The constitution of Athens, such as had never existed before, was the great work of Solon, and made property and not birth the title to citizenship, the aim being to give the lower classes some control of the law. The laws of Draco were repealed except those against murder; no man could be imprisoned for debt; a limit was placed on the ownership of land; and laws against luxury in food and dress were made. These laws, written on pieces of wood, were preserved in the Acropolis and the people bound themselves by oath to observe them for ten years. Solon traveled then in Cyprus, Asia Minor and Egypt, meeting Crœsus, king of Lydia, whom he offended by his answer to his question "Who was the happiest man in the world?" Solon replied that it was Tellos, an Athenian who had died for his country. Crœsus asked the question again, thinking to hear his own name in answer as the possessor of great wealth, but Solon gave the place to two Argive youths whom the gods permitted to die in their sleep as a reward for an act of kindness. (See Crœsus). His last years were passed at Athens, where he unsuccessfully opposed the usurpation of Pisistratus, his kinsman. He died about 558 B. C., leaving a command that his ashes be scattered over the "lovely isle" of Salamis. Consult *Histories of Greece* by Grote, Curtius and Cox.

Sol'way Firth is an inlet of the Irish Sea, lying between England and Scotland. It is 36 miles long and receives the waters of the Derwent and Eden on the English side and of the Esk, Dee and Annan on

the Scottish side. Near Annan the Firth is crossed by a railway bridge 5,880 feet long, which, built in 1866–69, was almost destroyed by floating ice in 1881. The scenery of the region is painted by Scott in *Redgauntlet* and *Guy Mannering*.

Solyman (*sŏl'ĭ-man*) or **Suleiman** (*sōō'lā-mān'*) **I,** called The Magnificent, was the greatest of the Turkish sultans. He was born in 1490, and succeeded Selim I, his father. He made many reforms in the internal government of his empire and was known as a patron of learning and of arts. Abroad, he began by extorting in 1521 the tribute refused by the king of Hungary and by overcoming the Knights of St. John at Rhodes, after a siege of six months and the loss of nearly 100,000 men. At the battle of Mohács, in August, 1526, he destroyed the Hungarian army, killing King Louis, and, marching on, captured Buda and Pesth. In 1529 he drove Ferdinand of Austria out of Buda, losing 40,000 soldiers in a vain attack on Vienna. He conquered large portions of Armenia and Persia and the whole of northern Africa except Morocco. A truce, made in 1562, finally left Hungary and Transylvania to Solyman. He died in 1565, while besieging a small fortress in Hungary.

Somaliland (*sō-mä'lē-lănd*) is a peninsula on the eastern coast of Africa that extends from the Strait of Bab-el-Mandeb to the Equator. It borders the Gulf of Aden and the Indian Ocean, has an area of 197,000 square miles with a population of 800,000, and is divided into Abyssinian territory and British, French and Italian protectorates. Abyssinia and England each possess considerable portions, but Italy controls far the largest area, while France has but a small section. Game abounds, and some parts of the country produce cacti, grasses and palms, but the territory is arid and generally barren. The inhabitants are Mohammedans and of difficult disposition. They live by their herds of camels, cattle, goats and horses and by a trade in coffee, frankincense, myrrh, ostrich-feathers and salt.

British Somaliland lies along the Gulf of Aden between French Somaliland and Italian Somaliland. When Egyptian control ceased in 1884, it became a British possession. Its area is 68,000 square miles; population 300,000 Muslim nomads, except on the coast where considerable towns have arisen since 1884; and chief city Berbera with 30,000 inhabitants in the trading-season. The annual fair deals in cotton-goods, dates and rice. The exports include cattle, gum, hides, ostrich-feathers, sheep and skins. Transport is by camels, there being no porters. The protectorate is governed by a commissioner of the British colonial office

French Somaliland, which now includes the older colony of Obok, extends from Eritrea to British Somaliland. Abyssinia lies behind it, the Gulf of Aden in front. Its area is 12,000 square miles, its population 50,000. The coast is arid, but the interior contains fertile areas. The capital is Jibutil, with 11,000 inhabitants, 500 being Europeans. France is developing the region rapidly, Jibutil having become an important shipping-station. A railway connects it with Diré Dawah, the station for Harar in Abyssinia. The country has scarcely any industries, but coastal fisheries and inland trade make considerable commerce. The chief exports are ivory, wax, coffee and living animals; the principal imports food, drink, tobacco, cottons, silks and Mocha coffee. Affairs are administered by a governor and council.

Italian Somaliland extends from British Somaliland down to British East Africa. Stretching 1,000 miles from north to south and extending 200 miles inland to Abyssinia, it covers 100,000 square miles and claims 400,000 inhabitants. Lying along the Gulf of Aden and the Indian Ocean, it occupies the extreme east or "horn" of Africa and ends in Cape Guardafui. It is but slightly known, but the bulk of the land seems arid though there are several fertile river-valleys. Arabs inhabit the coast, Somals, Gallas and other races the interior. The chief towns on the coast are Mogadishu and Obbia. The protectorate by Italy dates from 1889, and it grew in 1892, 1901 and 1905. The country is administered by the Italian government, which in 1905 gave some territory off the Aden coast to "the mad mullah," a Muslim fanatic who had for years troubled British Somaliland.

Som'erset, Lady Henry (Isabel), a daughter of the Earl of Somers, is a social and temperance reformer. Born in 1851, she married in 1873. She is the founder of a rural colony for female inebriates at Duxhurst, Surrey. She is well-known as a lecturer in the United States; has written for periodicals; is the editor of *The Women's Signal;* and has been president of the National British Women's Temperance Association. She is the author of *Studies in Black and White, A Book for Children* and *Our Village-Life.*

Som'erville, Mary (Fairfax), a Scotch scientist, was born at Jedburgh, Dec. 26, 1780. An algebraic sum in a magazine of fashions first interested her in the study of mathematics, in which she afterwards became famous. Her first husband, Captain Greig, was Russian consul in London, where she lived for two years until his death. The six years before her marriage with Dr. William Somerville she spent in study at Edinburgh. Going back to London in 1812, she attracted attention by experiments on the violet rays of the solar

spectrum, the results being published in the *Philosophical Transactions* of 1826. Lord Brougham asked her to put Laplace's *Celestial Mechanics* into popular form, which she did, publishing her book under the title of *Mechanism of the Heavens* in 1830. (See LAPLACE.) She was granted a pension in 1835 and made a member of the Royal Astronomical Society of England and of many foreign societies. She was in favor of "woman's rights" and woman suffrage. When 91 she spent five hours a day in mathematical studies. Other works published by her are *Connection of the Physical Sciences*, *Physical Geography* and *Molecular and Microscopic Science*. She died at Naples, Nov. 29, 1872, having lived in Italy for many years. Consult *Life* by her daughter.

Som'erville, Mass., is a suburb of Boston about two miles from the state-house. It manufactures flour, leather, iron and bricks, and has slaughter-houses, bleaching-works, iron-foundries and many fine residences. Population, 85,000.

Son'net, The. We owe the sonnet, in its structure and design, to Italy. Since Shakespeare and the early English sonneteers, Sir Thomas Wyatt, the earl of Surrey and Edmund Spenser, to Wordsworth, Cowper, Byron, Keats, Shelley and the modern English and American bards, the sonnet has always had a peculiar fascination for poets of the first class. The Italian sonnet was written in its perfection by Dante, Petrarch and Tasso; and, though the form of the Petrarchan sonnet has been closely followed by English poets, the Shakespearean form has been its keen rival — both dominating other rime* arrangements of this artistic, poetic form of 14 rimed or partially rimed verse. "The Italian sonnet consisted of 14 lines, divided into two groups of eight and six lines respectively; the first eight (called the *octave*) having only two rimes between them — the first, fourth, fifth and eighth lines being in one rime, and the second, third, sixth and seventh being in the other. There then was a pause in the sense, and the six concluding lines (called the *sestette*) had two rimes between them, those rimes generally alternating in the most finished specimens. In this form of sonnet Wyatt and Surrey wrote; but since then the only fixed rule in regard to the English sonnet has been that it should consist of 14 lines. The great English masters of this form of verse have all differed in their arrangement of the rimes. Spenser divides the 14 lines thus: The first and third lines rime one way; the second, fourth, fifth and seventh another; the sixth, eighth, ninth and eleventh another; and the tenth and twelfth another, the last two lines forming a couplet with another rime. Shakespeare's sonnets consist simply of three quatrains and a couplet, the rimes being seven in number. In Milton's sonnets there is the classic division into *octave* and *sestette*, the former being properly carried out, but the latter being fitted with three rimes.— the ninth and twelfth, tenth and thirteenth and eleventh and fourteenth riming together." Wordsworth admittedly is the greatest of English modern sonneteers, some of his sonnets, for exalted feeling as well as for felicity of fancy and of diction — as those dedicated to liberty and his ecclesiastical sonnets — including not only some of the finest things *he* ever wrote but some of the finest that were ever written. Here is one — in its design an apology for and commendation of the sonnet:

"Scorn not the sonnet; critic, you have frowned
Mindless of its just honors; with this key
Shakespeare unlocked his heart; the melody
Of this small lute gave ease to Petrarch's wound;
A thousand times this pipe did Tasso sound;
With it Camoens soothed an exile's grief;
The sonnet glittered a gay myrtle leaf
Amid the cypress with which Dante crowned
His visionary brow; a glowworm lamp
It cheered mild Spenser, called from Faery-land
To struggle through dark ways; and when a damp
Fell round the path of Milton, in his hand
The thing became a trumpet, whence he blew
Soul-animating strains — alas, too few!"

Sons of Lib'erty is the title taken by an organization first formed to oppose Grenville's stamp-act of 1764. It was strongest in New York and Connecticut. This association was active in promoting the separation of the American colonies from Great Britain. In Georgia the Liberty Boys drove out the royal governor; and in all the states they helped to overawe the loyalists. The Sons of Liberty incorporated about 1790 or 1800 with the Tammany Society.

Sontag (*zŏn'tăg*), **Henrietta,** Countess Rossi, a German singer, was born at Koblenz, Prussia, Jan. 3, 1806. She appeared on the stage when only six; studied music at Prague; and appeared there at 15. She rose to the first rank of European singers in her brilliant career at Vienna, Berlin and Paris. After her marriage with Count Rossi, an Italian nobleman, in 1828 she left the stage, but appeared again in 1849 on account of pecuniary troubles. She made a successful tour in the United States, and died at Vera Cruz, Mexico, June 18, 1854.

Sophocles (*sŏf'ō-klēz*), an Athenian poet, was born in 496 B. C. At 16 he was chosen to lead the chorus of youths who celebrated the naval victory of Salamis. At 28, in a dramatic contest, he was awarded the prize which had been given to Æschylus for many years. Only seven of his many dramas are preserved, but these place him at the head of the Greek dramatists. The probable order in which they appeared is *Ajax; Antigone; Electra; Œdipus the King;*

* Webster gives rime, not rhyme, as etymologically preferable and as again coming into use.

Trachinian Women; Philoctetes; and *Œdipus at Coloneus. Antigone*, one of the earliest dramas, produced in 440. gained the prize and so pleased the Athenians that he was made commander with Pericles in the Samian War. There are only fragments and titles of the other plays. He is said to have been beautiful in person, a fine musician and athlete and a ready wit. His death has been attributed to losing his breath in prolonging his voice in a public reading of *Antigone;* or to excess of joy at a dramatic victory; but without sufficient authority. He died in 405 B. C. Consult *Sophocles* in Green's "Classical Writers," by Campbell and *Lectures* by Schlegel. See ÆSCHYLUS, DRAMA and EURIPIDES.

Sorbonne (*sôr-bŏn'*), the earliest and most famous of the colleges of the University of Paris in the middle ages. It was founded in 1253 by Robert of Sorbon, and was the first institution connected with the university that was intended as a place of living as well as of study, as before this the great crowd of students of the university had found lodgings wherever they could. It was devoted to the study of theology, and the life was monastic, the students calling themselves "the poor masters of the Sorbonne." It soon became celebrated as the first theological school in Europe, its decision on disputed points was accepted as decisive, and it drew its scholars from all Europe. But when the new learning found its way into France at the beginning of the 16th century, the Sorbonne, though it had led to the introduction of printing in France, opposed all reform either in study or religion and lost its position. Its property was confiscated in the Revolution in 1792, but the Sorbonne was revived under Napoleon in 1808, and was made the seat of the three departments of the University of France,—theology, science and literature. New buildings were erected in 1884, the largest theater seating 3,000.

Soredia (*sô-rē'dĭ-â*) (in plants), minute granules which appear on the surface of many lichens, making them appear powdery. Soredia are scattered by the wind and form new lichens. Each one consists of a few alga-cells invested by some fungus filaments. See LICHENS.

Sorel (*sô-rĕl'*), **Can.,** county-seat of Richelieu County, Quebec, lies on the St. Lawrence at the mouth of Richelieu River, taking its name from a captain of the Carignan-Salières regiment, who built a fort on this site in 1665. It has 7,057 inhabitants, engaged in trade with the surrounding country and in its shipyards and foundries.

Sorghum (*sôr'gŭm*), a plant belonging to the grass family, whose original home is thought to have been the interior of Africa, but it has not yet been found growing wild there. It is nearly related to the sugar-cane, and has been cultivated from the most ancient times. It is extensively cultivated in this country for the production of sorghum-molasses, and a large amount of sugar is also manufactured as an incidental product. As a source of sugar, however, it does not compete with sugar-cane and the sugar-beet. See SUGAR.

Sorus (*so'rŭs*) (in plants), a definite group of sporangia, as in the ferns, in connection with which the term is chiefly used. See FILICALES.

Sothern (*sŭth'ĕrn*), **Edward Askew,** an American actor, was born at Liverpool, England, April 1, 1826. His first appearances on the stage in England and the United States were not particularly successful, until in 1858 he assumed the character of Lord Dundreary in the comedy of *Our American Cousins*, which was made so rich and entertaining by Sothern's acting that it became famous, the comedy running 140 nights in New York and nearly 500 in London, and being again and again repeated at other times. His most successful character next to Dundreary was David Garrick, both characters making his name famous. He died at London, Jan. 21, 1881. Consult Pemberton's *Memoir.*

Soulanges (*sōō'lânzh'*) **Canal, Can.,** extends from Cascade Point to Coteau Landing, overcoming the Cascade Rapids, Cedar Rapids and Coteau Rapids. From the head of the Lachine to the foot of the Soulanges the distance is 16 miles. Its length is 14 miles. It has five locks, 280 by 45 feet. The total rise or lockage is 84 feet. It is 100 feet wide at the bottom and 164 at water-surface. The depth of water on the sills is 15 feet. See LACHINE.

Soult (*sōōlt*), **Nicholas Jean de Dieu,** marshal of France, was born at St Amans-la-Bastide, March 29, 1769. He enlisted as a private and was six years in reaching the rank of sergeant, but then rose rapidly. He was from 1794 to 1799 in constant service in Germany and on the French frontier. He served in command of a division under Masséna in his Swiss and Italian campaigns. In 1802 Napoleon made him one of four consular guards, and in 1804 a marshal. He decided the battle of Austerlitz by piercing the Russian center, and was in the Prussian and the Russian campaign. He drove the British out of Spain and held Portugal until driven out in turn by Wellington. As commander in Spain he gained a victory at Ocaña in 1809, and subdued Andalusia. Failing to enlist Joseph Bonaparte in his plans, he asked to be relieved of his command, but was sent back by Napoleon, after the battle of Vittoria, as the only commander who could turn back the tide of disaster and successfully meet the strategy of Wellington with his own brilliant tactics. He became a royalist, when Napoleon had abdicated, but went back to him on his return from Elba. He was banished after

Waterloo, but in a few years was restored to his former honors. In 1838, at the crowning of Queen Victoria, he was sent as an ambassador to England and warmly welcomed by Wellington, his old opponent. His last honor was the title of Marshal General of France. He died on Nov. 26, 1851. Consult Napier's *History of the Peninsular War*.

Sound. See Acoustics.

Sound, The, a strait which forms the passage from the North Sea to the Baltic. It is 50 miles long, and lies between Sweden and the Island of Zealand. From the 15th century until 1857 all vessels passing through The Sound, with a few exceptions, paid toll. By the treaty of March 14, 1857, these Sound duties were abolished, about $16,000,000 being paid to Denmark, which agreed to keep up the lighthouses on the coast. Nelson forced the passage in spite of its strong defenses in 1801.

Sound'ing is measuring the depth of the sea. It has been done from the earliest times by a rope, marked off into fathoms, with a leaden weight attached. The difficulty was that there was no certainty that the weight had reached the bottom. In 1854 a new method was tried by which the weight or sinker would be removed from the line when it struck the bottom. Wire-rope is usually used for deep-sea soundings. Magellan tried to find the depth of the Pacific in his first voyage around the world, and, when he could not find the bottom at 200 fathoms, concluded that he had crossed the deepest part of the ocean. In 1818 Sir John Ross found the depth of the Arctic seas to be 1,050 fathoms; in the Antarctic Ocean he reached 2,425 fathoms, and twice, with 4,000 fathoms of line, no bottom was reached. Consult Sigsbee's *Deep-Sea Sounding and Dredging*.

Sousa (*sōō'zȧ*), **John Philip,** American orchestra-conductor and band-leader, was born at Washington, D. C., in 1854, and early manifested musical talent and proclivities toward the orchestra in theaters as well as familiarity with the life of a circus musician. Even at 17 he was a band conductor and one of the first violin players in an opera troupe. From 1880 to 1892 he was band-leader of the United States Marine Corps, and since director of his own well-known band. He has composed many orchestral pieces, marches, songs, waltzes etc., with light operas, as *El Capitan*, *The Bride Elect* (libretto and music) and *The Charlatan*. Among his other compositions, many of which have become very popular, are *Sheridan's Ride*, *The Liberty-Bell*, *The High-School Cadets* etc.

JOHN PHILIP SOUSA

South Af'rican Republic. See Transvaal.

South Amer'ica. See America.

South Austra'lia. See Australia.

Southampton (*sŭth-hămp'tŭn*), an important seaport in England, 79 miles southwest of London. There are remains of the town-walls, built in the 14th century, and four of the seven gates. The oldest church, St. Michael's, shows the Norman architecture, and God's House, dating from the 12th century, is one of the earliest hospitals in England. There are large docks, a new one covering 18 acres being built in 1890. There is a large cattle-trade with Spain and Portugal, and shipbuilding is extensively carried on. Southampton, called in the Saxon *Chronicle* Suth Hamtune, was founded by the Anglo-Saxons. It was burned by the French, Spanish, and Genoese fleets in 1338. The White Star steamships to the United States sail from Southampton. Population 119,745. Consult Davies' *History of Southampton*.

South Bend, Ind., county-seat of Saint Joseph County, on the St. Joseph River, 86 miles southeast of Chicago The Roman Catholic University of Notre Dame (*q. v.*), the largest Catholic school in the west, is a short distance north; there are fine buildings, a library and a Gothic church with the famous Chimes of Notre Dame, 13 full collegiate courses of study and 1,000 students. There are ten wagon and carriage works, the most extensive being the great Studebaker wagon and carriage works covering nearly 100 acres. The Oliver plow-works occupy 43 acres, and there are manufactories of agricultural implements, besides automobiles, steel-ranges, sheet-iron products, watches, knit-underwear, furniture, paper, woolens and flour. All told, the city contains over 300 factories. South Bend has 32 churches, admirable public and parochial schools, commercial schools, a teacher's training-school, a conservatory of music and a public library. Population 53,684.

South Beth'lehem, Pa., on Lehigh River, opposite Bethlehem, is the principal Moravian town in America, founded in 1745. South Bethlehem has factories of steel, zinc, boilers and shovels. It is the site of Lehigh University, founded in 1865 by Judge Packer, who gave 115 acres of land and $2.500,000. The fine buildings stand on a terrace on South Mountain, and include a fine gymnasium, observatory, several fine laboratories and a beautiful Gothic library-building. Population 19,973.

South'bridge, Mass., a town in Worcester County on Quinnebaug River, 21 miles from Worcester. The settlement was made

about 1730, and incorporated in 1816. Its chief manufacturing establishments are woolen and cotton mills, shuttle-works, optical instruments, printing and knife works. The town has good public and parochial schools, a high school, a fine library, several churches and a Y. M. C. A. building. Southbridge is on a branch of the New York, New Haven and Hartford railroad. Population 12,592.

South Car'oli'na, one of the original states of the American Union, popularly known as the Palmetto State, lies between North Carolina on the north, North Carolina and the Atlantic on the east, the Atlantic and Georgia on the south and Georgia on the west. It is shaped like a triangle. **Its area** is 33,393 square miles, and there are 41 counties. Population 1,634,340. The capital is Columbia and the largest cities in order of population, are Charleston, Spartansburg and Greenville.

Surface. The state consists of two distinct belts, the coastal plain and the Piedmont plateau, and is naturally divided into sections known locally as low country and up-country. These sections are separated by high sand-hills parallel to the coast and the mountains, forming the head of navigation on all the principal rivers. The coastal plain itself is what is called a belted coastal plain, being divided according to form, soil and vegetation into four belts parallel to the shore line: The coastal belt; the lower pine-belt; the upper pine-belt; and the hill-belt. Above the sand-hills are the Piedmont region, which stretches to the foot of the mountains, and the Alpine region, which begins at the foot-hills of the Appalachian Mountains and occupies the northwest corner. The Alpine region ranges from 900 to 3,000 feet in altitude. Mount Pinnacle in Pickens County, the highest point in the state, is 3,436 feet above sea level.

Rivers. The main river-systems are the Pedee, the Santee and the Savannah. These rise in the Appalachian region of North Carolina, and are navigable to the falls' line. Between the Santee and the Savannah system are the minor river-systems, which include Ashley, Cooper, Edisto and Combahee Rivers. The Ashley and Cooper, which are arms of the sea rather than rivers, unite in forming Charleston harbor.

Climate. The climate is equable and healthful, except in swampy portions near the coast. The summer's heat is tempered by the influence of the mountains in the northwest and by the sea-breezes in the southeast. The mean annual temperature is 63° F. The annual rainfall is 48.70 inches. The mountains in the higher part of the state are pleasant summer-resorts, while the dry, bracing atmosphere and the long-leaf pine-forests of the sand-hills make that section an ideal winter-home for invalids and pleasure-seekers.

Resources. The field and forest products are more varied, perhaps, than those of any other state. There is a variety of climate from the coast, where the sea is tempered by the Gulf-Stream, to the mountains, where it is too cold for cotton to mature. The products range from oranges, lemons and grape-fruit to rye, barley and wheat; the forest-trees from the palmettoes, cypress and magnolias to the ash, white pines and hemlocks. South Carolina leads the world in the yield of corn per acre, as demonstrated in world-contests; in the yield of upland cotton per acre; in the quality of sea-island cotton; and in the quality of rice. South Carolina has the only successful tea-gardens in America. In cotton-manufacturing it is exceeded only by Massachusetts and North Carolina. In volume of cotton crop it ranks fourth, the annual yield being over 1,100,000 bales. South Carolina was among the leading states in rice production but is now surpassed by Texas and Louisiana. The soils of the Piedmont Plateau regions are disintegrated granite and gneiss. In the level portions of the Plateau the granite has, in the course of the ages, crumbled into a mixture of sand and clay of a greyish color, giving way on the hills, through which the rivers flow, to a reddish clay, out of which the sand has been washed into the soil of the Coastal Plain, leaving it heavy. While in the upper section of the Coastal Plain the proportion of sand in the soil is too great for fertility. Lower down, where a larger admixture of finer material has been washed into it by the streams falling from the Plateau, it is more productive.

Manufacture. The forests of yellow pine, the products of the cotton fields and the rich beds of phosphates—the remains of prehistoric monsters—have furnished the basis for the leading industries of the state—lumbering, the manufacture of planing mill products, including sash doors and blinds, hosiery and knit goods, cotton-seed oil and cake and cotton goods, including plain cloths for printing or converting, brown or bleached sheetings or shirtings, twills and sateens, and the production of fertilizers. The manufacture of cotton goods is, however, by far the most important industry.

Minerals. There are two valuable gold-mines in operation, and several undeveloped gold mines. Rich deposits of kaolin and fine brick-clay extend entirely across the state. Granite quarries are numerous. A valuable tin-mine has recently been opened, and is proving a noteworthy success. There are deposits of iron, fuller's earth, manganese, monazite, asbestos, mica, nickel and many other minerals of commercial value, but the most valuable mineral resources are the beds of phosphate rock near Charleston and Beaufort. These

deposits underlie the surface from six inches down to 12 feet. All the rocks in these sections are phosphates.

The annual value of mineral products of South Carolina is:

Clay products	$753,004
Gold	7,400
Mineral waters	95,885
Monazite	18,104
Phosphate rock	910,589
Sand and gravel	34,514
Stone	218,045
Other products	51,884
Total	$2,089,425

Education. The state provides free schools for all children between six and 21. The schools for the white and the colored race are separate. The state supports four institutions for the higher education of the white people: South Carolina University at Columbia, South Carolina Military Academy at Charleston, Clemson Agricultural and Mechanical College at Clemson; and Winthrop Normal and Industrial College (for girls) at Rock Hill; and one for Negroes, the Normal and Industrial and Mechanical College (for both sexes) at Orangeburg. The institution for the deaf, dumb and blind supported by the state is at Cedar Springs.

Summary of Annual Educational Expenditures:	
4 State Colleges (white)	$ 350,000
1 State College (Negro)	25,000
25 Private and denominational Colleges (white)	300,000
10 Private and denominational Colleges (Negro)	100,000
359 City and town schools (white)	300,000
219 City and town schools (Negro)	70,000
2,313 County schools (white)	1,152,093
2,182 County schools (Negro)	252,380
Enrollment in public schools (white) 160,830	
Enrollment in public schools (Negro) 193,440	
Value of county school-property	$3,928,474

History. South Carolina was claimed by France, England and Spain either by right of conquest, purchase or discovery; but the first settlement on the soil was made by French Huguenots in 1562 near Beaufort. This colony was a failure. The first permanent settlement was made by the English in 1670 on Ashley River near Charleston. Two hundred Negro slaves were brought from Barbadoes in 1671, and since 1820 the Negro population has exceeded the white. In 1685 a large number of French Huguenots settled in South Carolina, and later German, Irish, Scotch and Welsh immigrants arrived. In 1729 George II divided the region into North and South Carolina. At first the government was in the hands of noblemen who appointed the governor under a constitution prepared by John Locke of England. Locke's constitution was poorly suited to the needs of the colony, and there was constant friction between the people and the governors. In 1719 proprietary government was abolished, and the colony was ruled by a governor and council appointed by the king and an assembly elected by the people. Prosperity began, and lasted until the beginning of the Revolution. In early years the colony suffered from Indian raids, but finally all the Indians except the Catawbas were driven out. These Indians still have a small reservation on Catawba River. Less than a hundred survive. In 1774 the first act was passed to oppose royal usurpation by force, and in the following year the first military force was raised for defense of the colony against the English government, and the importation of British goods was prohibited. The first important victory of the Revolutionary War was won at Fort Moultrie, June 28, 1776. Later, Charleston was captured and made the British headquarters in the south, Ninety-Six and Camden were taken, and, but for the resistance of Marion and Sumter, the state would have been conquered. The tide turned at King's Mountain, severe battles were fought at Cowpens and Eutaw Springs and the British were driven back until they held only Charleston. When the government under the Federal constitution had been established, South Carolina, under the direction of John C. Calhoun, soon became the leading exponent of state-sovereignty. The nullification act was passed in 1833, by which South Carolina declared the United States tariff null and not binding upon her citizens. The act was approved by the governor, but President Jackson pronounced it treason. The state-sovereignty contention almost precipitated war in 1833, and finally led to the Civil War in 1861–5. The state suffered heavily during the war, and worse during the reconstruction days which followed — a period of misrule and demoralization. The slaves already in the majority were made citizens. The better class of white people were not allowed to participate in the government. This state of affairs continued until 1876, when Gen. Wade Hampton was elected governor. Then the present era of prosperity began. In 1895 a new constitution was adopted, which required an educational or property qualification for citizenship. The right of suffrage belongs only to men 21 years old who can read and write and to men who, though they cannot read and write, own $300 worth of property. This law disfranchises a great number of ignorant and thriftless people. As there are more colored than white men disqualified, white voters are in the majority.

South Carolina, University of, was chartered in 1801 and opened in 1805. It closed in 1863 and in 1877. In 1865 departments of medicine and law were added. In 1878 the university divided into South

Carolina College and Claflin College, the first for white, the second for colored students. In 1882 new departments were added to South Carolina College, it ceasing to be merely a college of agriculture and mechanical arts, and in 1884 a law-school was added. In 1887 a college of pharmacy, a graduate department and a normal school were added. In 1890 the agricultural, mechanical, medical and normal courses were dropped, but in 1894 the last were restored. The university offers courses (1) in classics, Latin and science, Latin and literature or modern literature; (2) in mathematics, chemistry or chemistry and biology; (3) in normal studies; (4) in law; and (5) in graduate studies. The state gives 41 scholarships, one to each county, for normal students, and there are 12 other scholarships. The faculty numbers 25, the students 385 and the library 38,000 volumes. The college has no productive funds. Its income is, in the average, about $60,000.

South Dako'ta, a north-central state of the Union, familiarly styled the Coyote State. Its entire area is 77,650 square miles; length, 245 miles; extreme breadth 380 miles. Forming a rectangle, the state is bounded on the north by North Dakota, on the south by Nebraska, on the west by Montana and Wyoming and on the east by Minnesota and Iowa. It is traversed about its center from north to southeast by the Missouri, the chief settled and more fertile portion lying to the east of this river; while west of it are the Indian reservations and the mining region known as the Bad Lands together with the Black Hills. The total population of the state is 707,740. Of this total some 20,000 are Indians, the majority of whom live on reservations. Pierre is the capital, and the chief towns in order of population are Sioux Falls, Aberdeen, Lead City, Watertown, Huron, Mitchell and Yanktown.

Surface and Climate. The state has a dry bracing climate, with a mean annual temperature of 44.3° F., the warm chinook winds tempering the extreme cold and blizzards of winter. It has a light snow fall in winter and an average annual rainfall, especially in the settled and fertile eastern section, where farming is chiefly carried on. In the west much of the state is not only treeless, save in the region of the Black Hills, but is infertile, being for the most part covered with igneous rocks and coarse gravel which, unlike the glacial drift of New England, is singularly free from boulders. Mixed with the gravel is a rich vegetable mold, due in part to the decay of plants and in part to the decay of the gravel itself, thus making this one of the profitable regions for wheat raising. The famous Bad Lands are also distinguished by the great variety of curious and picturesque forms into which the streams have carved them. Slender columns of clay, capped by blocks of sandstone, which protect the soil immediately beneath them from the sculpturing of the rains, produce groups of what appear at a distance to be immense toadstools. The varieties of color in these clay columns, including cream, buff, pale green and grey, add greatly to the picturesque effect.

Agriculture and Manufacturing. While excelled by its sister state, North Dakota, in the production of the other cereals, it in turn excels its northern neighbor in the production of corn, owing to the fact that it lies farther south and, therefore, has a warmer climate. Potatoes, barley, flaxseed, hay and oats are inportant crops. Stock raising is an important industry, and the wool clip is in excess of 3,000,000 pounds. Over $5,000,000 in gold are taken annually from the Black Hills and a small amount of silver is mined, while there are fair returns from lead, copper and tin. Other mineral products include sandstone, limestone, clay and cement.

Commerce and Transportation. The mileage of the railroads of South Dakota exceed 3,947 miles, the chief lines on the east side of the Missouri being the Chicago, Milwaukee and St. Paul, the Chicago and Northwestern and the Great Northern. The Black Hills region in the southwest, with its principal mining towns of Lead City, Deadwood and Rapid City, is reached from railroads extending northward from Nebraska. The Missouri also is a chief artery of transportation. Banking facilities are good, there being 102 national banks which possess an aggregate capital of over four million dollars and individual deposits exceeding 27 millions. There are, besides, 502 state banks, with a combined capital of nearly $7,000,000, and over 43 millions of deposits. The assessed valuation of property (both realty and personal) is now very close upon 338 millions, showing an increase of over one hundred millions in five years.

Education. The total annual expenditure of public schools in South Dakota exceed four millions, nearly two millions being expended for teachers' salaries. Of the 167,020 of school population something over 120,000 are enrolled, though the average daily attendance is but 80,032. Besides, state normal schools located at Madison, Springfield, Aberdeen and Spearfish, by their excellent instruction and training, are constantly raising the standard of the educational service rendered by the schools. There is an agricultural college at Brookings rendering similar service to the state's agricultural development, and a school of mines at Rapid City. In the larger towns there are high schools. Higher education is represented by the following universities and denominational colleges; the University of South Dakota at Vermillion; Dakota Wesleyan Uni-

versity (Meth. Epis.) at Mitchell with 27 instructors and 375 students; Yankton College (Cong.) with 23 instructors and 224 students; Huron College (Presb.); Redfield College (Cong.); Sioux Falls College (Baptist); and Mennonite College at Freeman. Besides these institutions there are reformatory and penitentiary schools maintained by the state, schools for the blind and for deaf-mutes and asylums and hospitals for the insane.

History. (For the early annals and for the history of the Dakotas see NORTH DAKOTA). In 1828-30 a fort was erected at Pierre, which was subsequently sold to the Federal government. Late in the fifties settlement began at Sioux Falls and in the territory to the eastward, while Yankton became the territorial capital in 1863, which was removed 20 years later to Bismarck and, in 1889, to Pierre. An impetus was given to settlement by the construction of railroads, begun about 1872, and by the Custer discovery of gold in 1874 in the Deadwood district and the region of the Black Hills. The movement for statehood dates about from 1883, though it was not until 1889 that the state, and with it North Dakota, was admitted into the Union with a constitution of its own. Indian reservations were further opened to settlement in the nineties. Consult Child's *South Dakota;* Hagerty's *The State of South Dakota;* Beadle's *Dakota;* and Todd's *Hydrographic History of the State.*

South Dakota, University of, a co-educational institution, organized in 1882 at Vermilion, S. D., and mainly supported by the Legislature for the work it does in the geological survey of the state, though it is otherwise well-endowed by land-grants and other resources. Its courses of study embrace pedagogy, music, commerce and engineering as well as arts and sciences. It has a faculty of 50, a student attendance of 411 and a library of about 16,000 volumes. Its tuition fees are but nominal; while it has a loan-fund for the assistance of needy students.

South'ern Niger'ia. See LAGOS and NIGERIA.

South McAl'ester, Okla., a city, capital of the Choctaws, annexed in 1906; it is on the Choctaw, Oklahoma and Gulf, and Missouri, Kansas and Texas railways, about 50 miles south-southeast of Okmulgee, Creek Nation, and about 84 miles southeast of Fort Smith, Ark. It lies in a rich coal-mining district, and (besides several foundries, machine-shops and brick-plants) it has cotton compress establishments, flourmills, bottling-works, a tannery and macaroni, cigar and mattress factories. Settled in 1885, the town was incorporated in 1899 and has since grown considerably. It is not a part of the city of McAlester. The combined populations of the two cities is 12,954.

South Mount'ain, Battle of, an engagement of the Civil War precipitated by Lee's first invasion of Maryland in Sept., 1862. The battle occurred on Sept. 14th on South Mountain, a continuation of the Blue Ridge north of the Potomac, and near Boonsboro, Washington Co., Md., when the Federal army under McClellan fell upon the Confederates under Lee at Turner's and Crampton's Gaps in the mountain-range. There was stubborn fighting all day, as the Union forces pressed the rebels back and finally compelled them to withdraw, leaving their dead upon the field. At Turner's Gap there was a loss of about 1,500 on each side, while 1,500 Confederates were taken prisoners. At Crampton's Gap the losses were close upon 500 on each side, besides 400 Confederates taken prisoners. The engagement is known in the north as the Battle of South Mountain, while in the south it was called the Battle of Boonsboro.

South O'maha', Neb., a flourishing town, adjacent to Omaha City, in Douglas County, the seat of one of the largest meat-packing establishments in the United States. It is on the Chicago, St. Paul, Minneapolis and Omaha; Burlington; Fremont, Elkhorn and Missouri Valley; and Union Pacific railroads. It is now a part of Omaha proper. This incorporation was made in 1915. South Omaha tripled her population in the decade from 1900 to 1910. See OMAHA.

South-Sea Scheme, called the South Sea Bubble, was a plan orginated by Harley, Earl of Oxford, to provide for the extinction of the public debt. A company was formed to which was given the monopoly of the trade of the South Seas and of certain import duties. It agreed to pay the government six per cent. yearly on its debt of $50,000,000. The stock rose until it was quoted at 1,000, when some of the principal directors sold out. The bursting of the bubble followed, many large stockholders fled, and the excitement was so great that Parliament was summoned to decide on the best means of helping in the public distress. Though nothing fraudulent was proved against the directors, their property was confiscated for the benefit of the sufferers, and $35,000,000 due the government was remitted, but this only availed to mitigate very slightly the ruin wrought.

South'ern Cross, a group of stars in the southern hemisphere of the heavens, at a considerable distance from the south pole. The four principal stars form a rough cross. It was added to the list of constellations in 1679.

Southey (*south'i*), **Robert,** an English poet, was born at Bristol, England, Aug. 12, 1774. He studied at Oxford. Coleridge and Southey married sisters, and after various experiments, reading law, a secretaryship in Ireland, two visits to Lisbon, with intervals in London, Southey settled at Greta

Hall in the English Lake-Country where Coleridge lived, and devoted himself to writing, for a long time supporting Coleridge's family as well as his own. His works number nearly 50, filling more than 100 volumes, and many contributions to periodicals besides. *Madoc*, *Curse of Kehama*, *Thalaba* and *Roderick* are among his longer poems, though he is best known by a few short ones, as the *Battle of Blenheim* and *How the Water Comes Down at Lodore*, and by his *Life of Nelson*, one of the best biographies in English literature. He wrote also in prose a *History of Brazil* and *History of the Peninsular War*. His works brought him a competency and were rewarded by a pension, an honorary degree and the offer of a baronetcy, and in 1813 he was made poet-laureate. He died on March 21, 1843. See *Southey*, in the English Men of Letters Series, by Dowden.

Spadix (*spā'dĭks*), a peculiar spike-like form of inflorescence of the *Aroids* (*q. v.*), in which the axis is fleshy. The minute sessile flowers occur only on the lower part of the axis as in Jack-in-the-Pulpit, or completely cover it. See INFLORESCENCE.

Spain, one of the European states, forms with Portugal the southwestern peninsula.

Area and Surface. It is separated from France by the Pyrenees Mountains, and at its most southern point from Africa by the Strait of Gibraltar, and washed on three sides by the waters of the Atlantic and the Mediterranean. The Balearic Islands, on its Mediterranean coast, belong to Spain. The coast, 1,317 miles long, is broken by fine harbors, as Vigo, Corunna, Cadiz, Malaga and Barcelona. Its area is 194,783 square miles, its population 19 503,068. Madrid is the capital (population 571,539). Other chief cities are Barcelona (560,000), Valencia (213,530), Sevilla (155,366), Malaga (133,045), Marcia (124,085), and Cartagena (99,871). The Mediterranean shore in the south is rocky, sloping upward to the Sierra Nevada Mountains. The country is a high plain, crossed by several ranges of mountains, the highest points being in the Pyrenees and the Sierra Nevada. The rivers, of which there are 230, flow mostly into the Atlantic; the Tagus, Guadalquivir, Douro and Ebro being some of the largest.

Resources. The mines of Spain have been worked from the earliest times. There are mines of lead, copper, tin, iron, salt and coal. Gold and silver were formerly produced in Galicia, but now silver is found only in Seville, while the quicksilver mines of Almaden are the richest in Europe. The largest industry is farming, which employs from 60 to 70 per cent. of the people. Besides the cereal crops, saffron and dye-plants, mulberry trees for the rearing of silkworms and large quantities of southern fruits are cultivated. Wine is one of the principal exports. Large herds of cattle, sheep, hogs, asses and mules are raised, and the horses are descended from the Arabian breeds.

Manufactures. The manufactures do not equal those of the middle ages, when Spain was noted for wool and silk goods and arms. The principal manufactured products are cork and cotton, besides silk, linen, leather, glassware and arms. There are a comprehensive postal system, 9,190 miles of railway, 20,540 miles of telegraph and 4,970 miles of telephone.

Education. Spain has universities — at Madrid, Barcelona, Granada, Valladolid, Saragossa, Seville, Santiago, Salamanca, Oviedo and Valencia — with 391 professors and about 16,000 students. The school-system varies with different provinces, the larger cities and a few of the provinces having schools equal to the best in Europe, but in many others the schools are poor. The public and primary schools are supported mainly by the municipalities, and most of the children are educated free. However, a large proportion of the inhabitants are illiterate. There is on an average one school for every 560 persons.

Government. Spain is governed by a hereditary monarchy, its present constitution being settled in 1870. The Cortes, as the legislative body is called, consists of two parts — the senate and the chamber of deputies. One third of the senate hold their seats by inheritance, one third are appointed by the king, and one third are elected. In 1890 universal suffrage was introduced. The army in time of peace numbers about 100,000, and the navy 15,725 men, besides 9,000 marines. There are 13 military schools and colleges.

History. The Phœnicians and Greeks were the earliest visitors to Spain, where they found a race called by the Greeks Iberians, consisting probably of a number of different tribes. The Carthaginians made the first effort to occupy Spain, founding Carthagena, and were expelled by the Romans in 206 B. C. The Roman conquest was completed in 19 B. C., when Augustus divided *Hispania*, as they called it, into three provinces. The country became a thorough Roman province, adopting the Latin language and the Christian religion. After the invasion of the Goths, Spain became a province of the Visigoths until 573, when she became the seat of the Gothic kingdom, which was destroyed in 711 by the Arab and Moorish invaders. The Moorish kingdom in Spain, lasting three centuries, reached its highest prosperity in 756. Cordova, their capital, was the finest of western Europe, as may be seen in its grand mosque. Their last stronghold in Spain was Granada, which surrendered to the Spanish army on Jan. 2, 1492. The different provinces of Christian Spain have at times been independent and then conquered and

united. Alfonso I conquered Galicia, with a part of Leon and Castile, and called himself the king of the Asturias; and Alfonso III, taking possession of the whole of Leon, called it the kingdom of Leon. Navarre was an independent state in the 9th century, and became a powerful kingdom. Castile, at first a republic, was afterwards subject to Leon, then again independent until Ferdinand the Great united it with Leon. Aragon, first a part of Navarre, became an independent kingdom, and then was united with Catalonia. In 1037 the union of Leon, Castile and Galicia made Ferdinand the Great the most powerful ruler in Spain. The marriage of Isabella of Castile with Ferdinand of Aragon united those kingdoms, and the conquest of Granada completed the consolidation; which, with the conquest of Naples, the discovery of America by Columbus and the possession of large parts of the new continent, raised Spain to a high place among European nations. Philip II exhausted the strength of the country in his wars with the Netherlands, in his great preparations for the Invincible Armada and in building the Escorial. The great kingdom he had inherited from his father, Charles V, began to show decline. Spain sided with the emperor in the Thirty Years's War, but received nothing in return, and soon became a subject of contest between the different European powers. Philip V was the first of the Bourbon kings of Spain, whose accession led to the war of the Spanish Succession, ending in the peace of Utrecht in 1712. From 1808 till 1813 Joseph Bonaparte was king of Spain, though the people did not acknowledge him. Ferdinand VII was restored to power in 1814, and by the help of the French triumphed over the Liberal party in the kingdom. Florida was sold to the United States, and a large part of the South American colonies were lost during this reign. During the regency of Christina and the reign of Isabella the Liberal party gained ground until Isabella fled to France in 1878, resigning in favor of her son Alphonso XII. There were a provisional government for two years, then a short reign by Amadeus of Savoy and finally a republic, ending with the second Carlist war from 1872 to 1876. Don Carlos, who claimed the throne as a brother of Ferdinand, withdrew to France, and Alphonso XII reigned 11 years. The present king, Alphonso XIII, was born in 1886, but the country was governed by his mother as queen-regent until 1904. During 1868-78 Cuba struggled unsuccessfully for independence, Campos of Spain distinguishing himself then and again in 1895. The second revolt of Cuba (that of 1895) led to the Spanish-American war of 1898, that resulted in the complete destruction of the Spanish fleet and the loss of all colonies, save those in Africa. See SPANISH-AMERICAN WAR. Consult *Philip II* by Prescott; *The Moors in Spain* by Poole; *Wanderings in Spain* by Hare; and *Castilian Days* by John Hay.

Spalding, John Lancaster, Roman Catholic bishop of Peoria, Ill., was born on June 2, 1840 and died Aug. 25, 1916. After passing through the public schools of his own town, he attended St. Mary's College at Emmetsburg, Md. He received the degree of doctor of divinity at Louvain, Belgium, in 1863. After ordination he took a special course at Rome, Italy, and when 25 returned to the United States. For a time he was secretary and chancellor of the diocese of Louisville, at which time he took part, as a theologian, in the second plenary council of Baltimore. His first literary task was writing the life of his uncle (Archbishop Spalding of Baltimore). In 1872 he moved to New York City, where he was assistant-rector of St. Michael's Church, a post which he held until he was made the first bishop of Peoria on May 1, 1877. He several times refused to accept elevation in the church. As a writer John Lancaster Spalding was even better known than as a prelate, and as a lecturer he held a distinguished place in this country. His literary style has been compared to that of Emerson. Among his published works are *Socialism and Labor; Thoughts and Theories of Life and Education; Education and the Higher Life;* and *Things of the Mind.* In addition to his active interest in secular educational institutions and movements, he gave much of his time and thought to the furtherance of higher education within the church, and was practically the founder of the Catholic University at Washington. He was one of the arbitrators named by President Roosevelt to settle the anthracite strike in 1902. Because of ill-health his resignation was tendered to the papal see on Sept. 10, 1908.

Spandau (*spän'dou*), a Prussian town and strong fortress, is on the Spree, eight miles northwest of Berlin. As it defends the capital on that side, it is very strongly fortified, and in its citadel is kept the reserve fund of $30,000,000, reserved by the government ready for war. There are an arsenal, a cannon-foundry, gunpowder-factories and a garrison of 4,000 men. One of the oldest towns in Brandenburg, it surrendered to the Swedes in 1634, to the French in 1806 and to the Prussians in 1813. Population 84,919.

Span'ish Africa consists of Adrar and Rio de Oro on the Atlantic coast of the Sahara between Capes Blanco and Juby; Cape San Juan and Rio Muni between French Congo and Kamerun; Annobon, Corisco, Elobey and Fernando Po Islands in the Gulf of Guinea; and Ceuta and Melilla on the Mediterranean coast of Morocco, with Alhucemas, Chaferinas and Peñon de la Gomera. (The Canary Islands, though geographically belonging to Africa,

are a part of Spain for administrative purposes). The area of these possessions, which are the last fragments of Spain's once world-wide colonial empire, is 80,580 square miles, though some authorities who give an enormous extension to Spanish Sahara give the area as 243,890 square miles; and the population is 291,946. Rio de Oro and Adrar cover 70,000 square miles and have 130,000 inhabitants, governed from the Canary Isles. Rio Muni extends over 9,800 square miles, and possesses a population of 140,000, including 300 Europeans. The coast is low and marshy, luxuriant in vegetation and covered by huge forests. There are commercial agencies and mission-stations of Roman Catholics and American Presbyterians, but harbors are wanting and the rivers are inaccessible to ships. The islands in the Gulf cover 780 square miles and have 21,946 inhabitants. The North African possessions are used chiefly as convict-stations. Ceuta's population, included in that of Cadiz, Spain, is 13,000, Melilla's 9,000. The Spanish army in Africa is recruited wholly from Spain, and comprises 6,200 men. Spain has given France the right of preëmption in case it should sell any of the Spanish colonies or adjacent islands.

Spanish-Amer'ican War. The people of the United States had long watched the struggle of the Cubans (see CUBA) against the tyranny of Spain (*q. v.*), and with deep sympathy and indignation had witnessed the inhuman cruelties with which the war had been waged on the part of Spain. The devotion of the Cubans to their cause, the brutality with which the peaceable inhabitants of the island were treated and the inability of our government to induce Spain to adopt reforms that would be acceptable to the Cubans made intervention a duty the United States could not evade. The tension of the situation was increased by the destruction of the United States battleship *Maine* by an explosion while on a friendly visit in the harbor of Havana (*q. v.*), on the 15th of February, 1898. Of her crew, 266 men, including two officers, were killed. A naval court of inquiry after thorough investigation declared it to be their opinion that the *Maine* was destroyed by a submarine mine. The American people, while not asserting that the act was one of treachery on the part of the Spanish government, did believe that without complicity on the part of Spanish officials at Morro Castle the vessel would not have been blown up by mines operated by electric batteries located within that fortification.

Matters now drifted rapidly toward war. On April 11, 1898, President McKinley sent a message to Congress in which he declared that he had exhausted every effort to prevent a resort to arms. On April 19 Congress passed the following preamble and resolutions:

WHEREAS, The abhorrent conditions which have existed for more than three years in the island of Cuba, so near our own borders, have shocked the moral sense of the people of the United States, have been a disgrace to Christian civilization, culminating as they have in the destruction of a United States battleship, with 266 of its officers and crew, while on a friendly visit in the harbor of Havana, and cannot longer be endured, as has been set forth by the President of the United States in his message to Congress of April 11, 1898, upon which the action of Congress was invited; therefore,

Resolved, 1. That the people of the island of Cuba are and of right ought to be free and independent.

Resolved, 2. That it is the duty of the United States to demand, and the government of the United States does hereby demand, that the government of Spain at once relinquish its authority and government in the island of Cuba and withdraw its land and naval forces from Cuba and Cuban waters.

Resolved, 3. That the President of the United States be, and he hereby is, directed and empowered to use the entire land and naval forces of the United States and to call into actual service of the United States the militia of the several states, to such extent as may be necessary to carry these resolutions into effect.

Resolved, 4. That the United States hereby disclaims any disposition or intention to exercise sovereignty, jurisdiction or control over said island, except for the pacification thereof, and asserts its determination, when that is accomplished, to leave the government and control of the island to its people.

On April 21 the American minister at Madrid received passports from the Spanish government, and on the same day the Spanish minister left Washington. On April 24 Spain issued a declaration of war with the United States, and next day the American Congress issued a similar declaration. The president issued a call for 125,000 volunteers, and the equipment of army and navy was vigorously pushed. The first action of importance was the naval battle in Manila Bay. At daybreak on May 1 Commodore Dewey, in command of the Asiatic squadron of the United States navy, entered the harbor. His squadron consisted of the cruisers *Olympia* (flagship), *Raleigh*, *Baltimore* and *Boston* and gunboats *Concord* and *Petrel* and the revenue-cutter *McCulloch*, with two transports. Here he met the Spanish fleet, consisting of the *Reina Cristina*, *Castilla*, *Don Antonio de Ulloa*, *Isla de Luzon*, *Isla de Cuba*, *Gen. Lezo*, *Marquis de Duero*, *Cano*, *Velasco*, *Isla de Mindanao*, some small gunboats and a transport. The result of the battle was the entire destruction of all the Spanish vessels and the silencing of the land-batteries. Commodore Dewey did not lose a ship nor a man, while the Spanish lost their entire fleet and from 600 to 700 men.

Spain sent to the defense of Cuba a fleet under command of Admiral Cervera (*q. v.*), which took a secure position in the harbor of Santiago (*q. v*). The city was also garrisoned by a Spanish army under General Linares. This city and harbor thus became the objective point of American attack.

The American fleet, under Admiral Sampson (*q. v.*), being unable to enter the harbor, which was thoroughly protected by fortifications, took position before the entrance, to prevent egress of the Spanish fleet. An American army of 15,000, under Major-General Shafter (*q. v.*), landed at Baiquiri, near Santiago, June 23. Advancing, they encountered a Spanish force at Las Guasimas on June 24, and a sharp engagement was fought, the enemy being driven back. On July 1 a severe and decisive battle was fought on the heights of San Juan and El Caney, overlooking Santiago, resulting in the defeat of the Spaniards. General Linares was wounded. General Vara del Rey, second in command, was killed, and the command of the Spanish forces, which withdrew within the fortified lines of the city, devolved on Gen. José Toral.

On July 3 the Spanish fleet under Admiral Cervera attempted to escape from the harbor of Santiago. As the vessels appeared in line they were pursued by the *Brooklyn*, the *Oregon*, the *Iowa* and the *Texas* of the American squadron and the converted yacht *Gloucester*. The Spanish ships *Maria Teresa*, *Almirante Oquendo* and *Vizcaya* were within a few minutes forced ashore and surrendered. The *Cristobal Colon* made a desperate attempt to escape, but was run ashore and sunk about 60 miles from the mouth of the harbor. The two torpedo-boat destroyers, *Furor* and *Pluton*, were wrecked within four miles of the harbor. Admiral Cervera, Captain Eulate and more than 1,300 officers and men were taken prisoners. The loss of life on the Spanish vessels was large, while on the American fleet only one was killed. None of the American vessels was injured seriously in the engagement.

On July 17 General Toral surrendered to General Shafter his army and the city and province of Santiago de Cuba, which embraced all eastern Cuba. An American army under General Miles landed on the island of Porto Rico at Guanica, July 25, and advanced toward San Juan, occupying various points without serious fighting. On Aug. 12 a peace-protocol, suspending hostilities and providing for the appointment of commissioners to treat of peace between Spain and the United States, was signed at Washington, the French minister, M. Cambon, acting in behalf of Spain. The American troops, under General Merritt and the fleet under Admiral Dewey made a combined attack on Manila, August 13, and after six hours' fighting the Spaniards surrendered the city with 7,000 prisoners.

The peace-commissioners appointed by Spain and the United States met at Paris, Oct. 1. The United States commissioners were William R. Day of Ohio, Senators William P. Frye of Maine, Cushman K. Davis of Minnesota and George Gray of Delaware, with Mr. Whitelaw Reid of New York. After lengthy deliberations a treaty of peace was signed, Dec. 10, 1898. By this treaty Spain relinquished all claim of sovereignty over or title to Cuba, and ceded to the United States Porto Rico, Guam and the Philippine Islands; the United States agreeing to pay to Spain the sum of $20,000,000. The close of the war, which lasted only 113 days of actual hostilities, left Spain with no colonial possessions in the western hemisphere. See PHILIPPINE ISLANDS and PORTO RICO. See *History of the Spanish-American War* by H. Watterson.

Sparks, Ja'red, an American historian, was born at Willington, Conn., May 10, 1789. He studied at Harvard, settled as a Unitarian minister at Baltimore, and finally became editor of *The North American Review*. He was ten years a professor of history at Harvard, and for four years its president. His writings include *John Ledyard*, *Gouverneur Morris* and *Library of American Biography*, in ten volumes. He edited the *Works of Benjamin Franklin*, the *Writings of George Washington* and *Correspondence of the American Revolution*. He died at Cambridge, Mass., March 14, 1866. See *Memoir* by G. E. Ellis.

Spar'row, any one of various small birds belonging to the finch family. They are plainly colored and usually have their plumage streaked with brown, black, gray and rusty. About 30 common varieties are found in the United States, and among them are a number of good singers. They are hardy birds, feeding on seeds, and some kinds are to be seen in any month of the year. Some kinds go south at the approach of winter, others are permanent residents, and still others come from the far north, where they nest, to spend the winter in the United States. The song-sparrow is one of the commonest and rears three broods a year. The chippy is very common about our yards and houses. The most persistent is an imported bird — the common European house-sparrow or English sparrow, which was introduced into the United States about 50 years ago. Although destroying many caterpillars, it drives other birds before it and has become a nuisance and a pest, but they are too numerous and multiply too rapidly to be easily got rid of. Other well-known kinds are the fox-sparrow, swamp-sparrow, tree-sparrow, field-sparrow and the white-throated sparrow.

Sparrow-Hawk, a small falcon, abundant in the United States. It is about 11 inches long, with a tawny plumage, marked with bluish and black, a rusty-colored crown and a chestnut tail. There is considerable variation in its plumage. Notwithstanding its small size, it is one of the most active and courageous of birds. The sparrow-

hawk is the American representative of the European kestrel, which is a larger but similar bird. It feeds upon mice, grasshoppers and other insects. Its nest is usually in a hollow tree.

Spar'ta, the ancient Lacedæmon, the famous Greek city, was in the southern part of Greece on the Eurotas, about 20 miles from the Mediterranean. It was shut in by mountains, one, Mt. Taygetus, rising 8,000 feet; and the valley was so easily defended that it was not regularly fortified until 195 B. C. The city had few fine buildings; the Acropolis was a steep hill with a temple to Athena on its summit, and the white marble theater was one of the largest buildings. The city was formed from several scattered hamlets, and was governed by two kings, whose powers were equal, and who at first were priests, judges and generals as well as rulers. There were three classes of citizens; the Spartiatai or governing class, the Perioikoi, who were free but had no voice in matters of state, and the Helots or slaves, who were bound to the soil, cultivating it for its owners, and were also employed in war. The greatness of Sparta is due to the laws of Lycurgus, which made it a nation of soldiers. There is some doubt resting on the received traditions of Lycurgus, but there certainly was a very ancient legal code, dating back to 825 B. C. The citizens, according to this code, lived only for the state, and children were under the public care. If deformed or weak, they were not allowed to grow up; if healthy, they were taken from the mother when seven years old, and drilled in military exercises, in habits of endurance and skillfulness and in speaking short sentences, to the point, which last gave rise to the expression, "laconic," from the name of the province, Laconia. Their training is illustrated in the story of the boy with the stolen fox, who was applauded because he bore the torture of the desperate animal tearing his flesh rather than by crying out and confessing that he had stolen him. Between the ages of 20 and 60 all Spartans served in the army, and, though allowed to marry and to engage in business, ate and slept in the public barracks. The early struggles of Sparta with Messenia, Argos and Athens, gave Sparta the victory and made it the chief power in Greece, but its tyranny induced rebellion, and the Thebans under Epaminondas reduced Sparta to its old boundaries. The Macedonians still further cut off its provinces, and finally, with the remainder of Greece, it became a part of the Roman empire. The modern town of Sparta, founded by the Greeks in 1836, the capital of Laconia, occupies a part of the site of ancient Sparta.

Spartacus (*spär'tă-kŭs*), a leader in a revolt of Roman slaves, about 73 B. C., was born in Thrace. He was first a shepherd, then the head of a band of robbers, and when taken was sold to a trainer of gladiators at Capua. He escaped with 70 others and fled to the crater of Vesuvius. Here he was joined by many runaway slaves, conquered all forces sent against him, and sacked many of the cities of southern Italy. His army increased to 100,000 men, whom he sought to induce to march across the Alps and to seek their old homes, but the fever of revenge and conquest was upon them, and Spartacus continued his fight with the Roman authorities. At last he was defeated by Crassus in 71 B. C. while trying to seize the shipping at Brundusium, and was slain at Petelia.

Spar'tanburg, S. C., capital of Spartanburg County, on the Glen Springs, Charleston and Western Carolina and Southern railroads. It lies 94 miles northwest of Columbia, the capital, and 72 miles southwest of Charlotte, N. C. It is the seat of Converse College and of Wofford Methodist Episcopal College, and has a number of churches, schools and other public institutions. It has extensive cotton manufactories and has been called the Lowell of the South. This industry has greatly advanced the growth and prosperity of the city. Population 17,517.

Spathe (*späth*), the very highly developed bract which invests the spadix. In Jack-in-the-pulpit it is tubular below, and spreads above into an overarching hood. In the calla lily it is very large, and beautifully white. The spadix with its spathe is characteristic of the Aroids, and in the numerous tropical forms the spathe is extremely varied in form and often brilliantly colored.

Spe'cie Payments in the U. S., Suspension and Resumption of (1861–79). In consequence of the Civil War and the beginning of the drain on the United States government to meet its current obligations in metallic money, the nation, following the action of the banks, suspended specie payments at the close of 1861 and resorted to the issue, in large sums, of legal-tender paper-money ("greenbacks" the notes were called) in lieu of gold and silver in the payment of debts and taxes. The suspension, which lasted until Jan. 1, 1879, had the effect of depreciating the national paper-currency to half its face-value in gold; though, when the war closed, the government, in pursuance of an honest financial policy, began to redeem its obligations with coin and stopped the issue of the U. S. legal-tender notes. This had its effect on the national currency, which began steadily to rise in value. The government finally grappled with the financial problem and solved it by announcing that on Jan. 1, 1879, the resumption of specie payments would take place. The government kept faith with its creditors and the nation on

the day specified, when, through the sale of bonds and the accumulation of surplus revenue etc., gold and silver were once more paid out. The result proved the wisdom of the government and banished all misgiving, for, when 1879 opened, only about 11 or 12 million dollars' worth of notes were offered for redemption, while the treasury at Washington had in its possession about ten or twelve times the amount in gold in its vaults.

Specif'ic Grav'ity. See DENSITY.

Specific Heat, a term used in the physical sciences and in engineering to denote *the quantity of heat necessary to raise the temperature of one gram of a substance through one degree centigrade at any given temperature.* This quantity of heat is known as the specific heat of that substance at that temperature. If we use the *calorie* as the unit of heat, an exactly equivalent definition of specific heat is the following: *The ratio between the amount of heat required to raise the temperature of any body one degree and that required to raise the temperature of an equal mass of water one degree.*

The following is a table of specific heats of some of the more common substances:

Aluminum	0.214	Tin	0.056
Sulphur	0.203	Iodine	0.054
Iron	0.114	Antimony	0.051
Copper	0.095	Mercury	0.033
Zinc	0.095	Platinum	0.032
Silver	0.057	Lead	0.031

See HEAT.

Spec'tacles are instruments used for aiding the sight. They are said to have been invented in the 13th century. The first ones were very clumsy, and there was very little improvement until the beginning of the 19th century. Spectacles are worn for strengthening the vision, when it is weakened by old age, or to remedy any natural defect, such as nearsightedness, and also to protect the eye from too strong light. The glasses or lenses used should be made of the best of glass and carefully ground, though sometimes they are made from rock-crystal and called "pebbles." The glasses should be very carefully selected to accomplish the purpose intended, it being often necessary to fit each eye separately. For short sight or nearsightedness the lens is concave, and the weakest glass that will permit distant objects to be seen should be used. For the weakness of old age, which is farsightedness and is first noticed by one's holding a book farther off in reading etc., the lens is convex, and the strongest glass should be used.

Spec'trograph. See SPECTROSCOPY.

Spec'troscope. See SPECTROSCOPY.

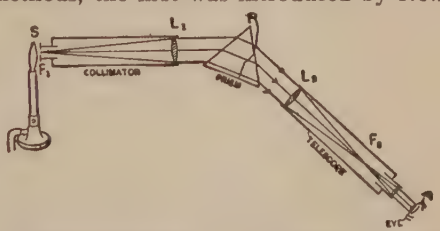
Spectroscopy (*spĕk-trŏs'kŏ-pȳ*) is a science which has for its object the determination and description of the various radiations which bodies emit, reflect and absorb. It is to be carefully noted that spectroscopy does not end in the observation of phenomena, but includes also the description of these phenomena in a manner which is at once the simplest and most complete.

METHOD OF SPECTROSCOPIC SCIENCE

The examination of a body by means of the spectroscope includes four steps. These are *the Production of Radiation; the Separation of the different Radiations; the Recording of the Radiations;* and *the Comparison of the Radiations.* We shall consider the subject from these four points of view.

A. What the spectroscope receives and analyses is radiant energy. It follows naturally, therefore, that *the first step* in examining the spectrum of any body *is to make that body a source of radiant energy.* In many cases this step has already been performed for us. Thus the fixed stars and the gases in which lightning-discharges occur are already rendered self-luminous. All we can do, therefore, is to *observe* their spectra; we cannot *experiment* upon them. Bodies at the surface of our earth can generally be made to radiate energy (1) by heating them, as in the case of a red-hot poker; (2) by passing an electric current through them, as in the case of the Plücker tube; (3) by means of chemical combination, as in the case of the Bunsen flame; or (4) by means of luminescence, of which fluorescence and phosphorescence are examples. As to just how and why these processes cause bodies to emit radiant energy very little is known.

B. Passing now to the second step, namely, *the separation of the radiant energy of one wave-length from that of the others,* this is the peculiar function of the spectroscope, and is usually accomplished in one of two ways: either by interposing in the path of the ray a prism which impresses upon each ray of different wave length a different direction; or by placing in the path of the rays a diffraction-grating which accomplishes the same thing. (See PRISM and DIFFRACTION-GRATING.) Of these two methods, the first was introduced by Newton about the middle of the 17th century, and the second by Fraunhofer near the beginning of the 19th century. The ordinary prism-spectroscope, shown in figure 1, is



A PRISM-SPECTROSCOPE ADJUSTED TO VIEW ONE PARTICULAR COLOR IN THE SPECTRUM

generally made up of three parts, viz., a prism and two astronomical telescopes. One of these telescopes is used to render the rays which fall on the prism parallel to each other, and is therefore called the *collimator*. The other telescope is made movable so that it can be turned into the proper direction for observing any desired color, and is, therefore, called the *view-telescope*. A *grating* spectroscope is essentially of the same construction (see figure 2) except that the dispersion, *i. e.*, the separation, of the rays is produced by the grating at G, instead of by a prism. The radiant energy is here admitted through the small narrow opening at S_2, called the *slit*.

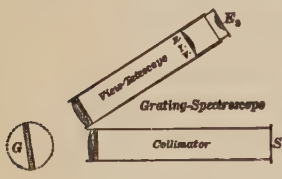


FIG. 2

An image of this slit is produced in the focal plane of the view-telescope, and in the ordinary spectroscope is there examined by means of an eyepiece. But, if we place a small camera at the end of the view telescope in such a position that the photographic plate will lie in the focal plane of the telescope, we can then obtain a photograph of these images. Such an instrument is called a *spectrograph*.

Among the most powerful spectroscopes known must be mentioned the curved grating instrument devised by Rowland. For the best account of this see Kayser's *Handbuch der Spectroscopie*. In the same class must be mentioned Michelson's echelon spectroscope, which is well-described in Drude's *Lehrbuch der Optik*.

C. Passing now to *the manner in which spectra are recorded*, this depends partly upon the portion of the spectrum under examination and partly upon the purpose of the examination. If it is merely the appearance of a line, a glance of the eye may suffice, provided the line is in the visible part of the spectrum.

But in the ultraviolet part of the spectrum photography is practically the only available means for obtaining a record. In the infrared portion of the spectrum we cannot see and cannot easily photograph what is there; so that here the radiomicrometer or bolometer or radiometer must be used. In general, photography is the best and most easily worked method whenever it is applicable.

D. Comparison of Spectra. Let us suppose now that by some means we have analyzed the radiation from a certain body and have recorded its spectrum. The next step in the process is to apply this information to the purpose for which it was obtained. This last step — the interpretation of results — perhaps is the most important one of the four, and the one which demands, in its execution, the largest measure of care and experience. After a spectrum is once obtained it becomes generally necessary to compare it (1) with itself when the radiation is produced under different conditions; (2) with itself when recorded in another way; (3) with the spectra of other bodies; (4) with some spectrum which has been predicted by theory; or (5) with a standard scale of wave-lengths; that is, with an ideal spectrum in which each line differs from its neighbor by one of the units in which wave-lengths are measured.

HISTORY OF SPECTROSCOPY

A bare outline of the steps by which this science has reached the high degree of perfection which it to-day possesses would be something like the following:

1. Newton, by his careful study of the prism, gave a fairly complete answer to the question of separating the various radiations.

2. Young and Fresnel, by establishing the wave-theory of light along the lines laid down by Huygens, placed spectroscopy upon a sound scientific basis.

3. Fraunhofer, by inventing the diffraction-grating, greatly increased the power and simplicity of the instrument.

4. Kirchhoff and Bunsen (1859) showed that each chemical element emits a characteristic radiation and, thereby, established the science of spectrum analysis.

5. Rowland, by the perfection of the plane grating and by the invention of the curved grating, as well as by his superb published spectra of the sun and elements, revolutionized the entire science and gave it a precision hitherto undreamed of.

6. Kayser and Runge, by their study of the spectra of the elements, have shown that there is an order, and not a chaos, running through the thousands of lines already mapped.

7. Michelson (1890–1900) has shown us how a single line in any spectrum may be analyzed and studied in detail; and has thus, at once, multiplied the power and the problems of the science. This he has accomplished by the invention and use of the interferometer and the echelon spectroscope. Kayser's *Handbuch der Spectroscopie* is incomparably the best treatise ever written on this subject. HENRY CREW.

Spec'trum. If a prism or a diffraction-grating be interposed in the path of a beam of white light, it will, provided the beam of white light be small, spread this beam out into a colored band in which the colors are arranged in the following order: *red*, *orange*, *yellow*, *green*, *blue*, *violet*. This colored band is called the *spectrum* of white light.

If, instead of a pencil of white light, we had passed through the prism a pencil of light from the Bunsen flame, it too would

have been separated into its constituent colors, in this case *green*, *blue* and *violet*, which are the spectrum of the Bunsen flame. If an electric arc had been employed, we should have obtained the spectrum of the electric arc, even though a large part of the radiation from the arc is invisible—has no color—and must be detected by the photographic plate.

So we define the spectrum of any body as the *ensemble* of its radiations visible and invisible, arranged in the order of their wave-lengths. See SPECTROSCOPY.

Spectrum Analysis, the act of ascertaining the character and composition of luminous bodies by causing a ray of light from the body to pass through a prism, each substance in the spectrum having its own characteristic system of lines—as in a star, a planet or any heavenly body in a state of incandescence or in metals submitted by the chemist to great heat. See SPECTROSCOPY.

Speculum (*spĕk'ū-lŭm*) **Metal** is an alloy composed of 126 parts of copper and a little over 58 of tin, which is used for the mirrors or *specula* of telescopes. It is very brittle, will take a fine polish, and does not tarnish easily. A silvered glass is, however, taking its place, being just as good and less expensive.

Speke (*spēk*), **John Hanning,** an African explorer, was born on May 4, 1827, in Somersetshire, England. At 17 he entered the Indian army, where between his periods of military service he collected specimens in natural history and planned available routes of travel. In 1857 he was sent out with Burton by the Royal Geographical Society to find the great lakes of Central Africa. Speke, when alone, discovered the Victoria Nyanza, and in 1860, while associated with J. A. Grant, he returned and explored its coasts and followed the river until he was satisfied it is the Nile. It was disputed, however, by Burton and other travelers, and Speke made arrangements for a public discussi n with Burton at Bath. But on the morning of the day set, Sept. 15, 1864, he accidentally shot himself. His writings are *Journal of the Discovery of the Source of the Nile* and *What Led to the Discovery of the Source of the Nile.*

Spell'ing. The art of orthography as taught in the elementary school. It formerly was closely associated with reading, but has come to be treated in connection with written composition. This is due to the fact that people do not ordinarily spell, except when they are giving written expression to their thoughts. The ideal selection of words would be from those most commonly used in composition, rather than from reading, which represents, for the child, a much larger vocabulary. The subject, as a separate school-study, usually begins in the second school-year and extends through the elementary school.

Spelling represents the attempt to associate the actual order of letters which go with a meaning and its spoken symbol. In perfect spelling the child has a fixed association of three elements: The meaning of the word, the pronunciation of the word and the spelling of the word. The presence of any of these factors ought immediately to recall the other two. All should be *presented together* so as to be *recalled together.*

(1) There are four general ways of getting the meaning of a word: (a) By experience, through action, observation, conversation etc., (b) by the context of surrounding language, (c) by the teacher telling the child and (d) by the use of the dictionary. (2) The pronunciation may be obtained by three typical methods: (a) By example, whether it be by the chance example of one's fellows or by the model of pronunciation deliberately given by the teacher, (b) by phonetic translation from the printed word, where either the letters (d-ē-r-ā-n-g-ȩ-m-ĕ-n-t), syllables (de-range-ment) or phonograms (de—r-ange—in-ent) are changed into sound and combined, and (c) by the use of the dictionary, where the sound of a letter in a familiar word at the bottom of the page is transferred to the word under investigation through the similarity of diacritical marks in both. (3) The correct order of letters is usually found in one of four general ways: (a) By having the child copy the word from a book or from the teacher's spelling, (b) by using the dictionary, which is *very difficult* for the child who does not know the spelling and, therefore, has to guess at its beginning until he finds the word, (c) by looking attentively at the word (visualization) and then memorizing it and (d), when the word is very regular and pronunciation will suggest the order of letters, by translating his pronunciation into letters.

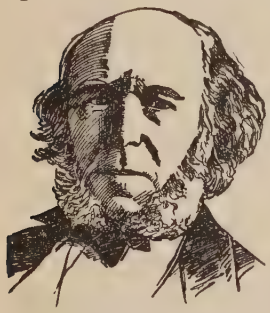
In actual teaching there are many ways of presenting the spelling of the word, with its pronunciation and meaning. The teacher will usually (1) revive the meaning carefully, (2) have the child look attentively at the written word (visual impression), (3) have him copy it carefully (motor impression), (4 pronounce it carefully for the child to hear (auditory impression); and (5) then have the child speak it (motor impression).

The spelling must be practiced so as to fix the order of letters in his memory. This may be done (1) by the spelling of single words in written lists, (2) by spelling the single word aloud, pronouncing the same before and after (dog, d-o-g, dog), (3) by spelling the word in a sentence. This spelling of words in sentences may be (a) in copying, (b) by taking down dictation and (c) by writing the words in any composition where the child is trying

to express his own thoughts. The last-named method is the best test of ability to spell.

With the usual elementary-school child, below the seventh or eighth grades, it is now preferable to teach homonyms (to, too) separately and without reference to each other. Word-analysis and word-study as aids to spelling are passing from the course of study. They are good ways of helping the child to guess at the spelling of a word from its linguistic derivation when there is no dictionary available, but good spelling in the elementary school now demands a precise, direct and authoritative spelling made habitual by practice.

Spen'cer, Herbert, an English philosopher, was born at Derby, April 27, 1820.



HERBERT SPENCER

His father was a teacher, and the son inherited a taste for natural science, keeping collections of insects and making drawings of them as a boy. His first work was that of a civil engineer, in which he was engaged for about eight years, publishing articles in *The Civil Engineers' and Architects' Journal.* From 1848 to 1853 he was an editor of *The Economist.* His first important publication was *Social Statics* in 1850. His great plan was the working-out of a system of philosophy based on the doctrine of evolution, the theory that the world is the result of a long series of changes, produced by force acting on matter and resulting in motion. In applying evolution to the study of man in society Spencer employed assistants to collect and arrange all sorts of facts in regard to customs, worship, government etc. of savage tribes, ancient and modern races. His philosophical writings are very numerous, *Principles of Psychology, First Principles, Principles of Biology, Data of Ethics* and volumes of essays being among the best known. His brilliant power of drawing conclusions from a vast array of facts; his great knowledge of science and his wealth of illustration made him popular as well as gave him a high position among philosophers. (See FISKE, JOHN.) His most popular works are a small book on *Education* and *The Study of Sociology.* He died on Dec. 8, 1903.

Spencer, Mass., a Worcester County town, population 5,980, 900 feet above sea level, settled in 1752, is situated on the Boston & Albany railroad, 12 miles west of Worcester. It is the birthplace of Elias Howe, inventor of the sewing machine, and contains the Luther Hill Public Park, David Prouty High School, Richard Sugden Block and Library, gifts of public-spirited citizens. The chief industries are shoe, wire and woolen goods, paper and wooden box factories. Population 7,000.

Spenser, Edmund, an English poet, was born at London about 1552. He studied at Cambridge, obtaining considerable knowledge of Latin and Greek literature, as is seen in his works, and making a friend of Gabriel Harvey. In 1579 appeared his first work, *The Shepherd's Calendar,* the first note of the great Elizabethan poetry. It was dedicated to Sir Philip Sidney (*q.v.*), one of his stanchest friends, whose acquaintance he had made probably through Harvey. Through Leicester, Sidney's uncle, doubtless, he was appointed secretary to the lord-deputy of Ireland, which thus became his home. The country was in rebellion, and Lord Grey suppressed it so cruelly as to be recalled, and Spenser learned the lesson of massacre and extermination, which he afterward advocated, making his name hateful to the Irish nation. His great work, *The Faerie Queene,* was begun in England, but the larger part was written in Ireland. The first three books were published in 1590 and brought great fame and a small pension, but no political preferment, as he had hoped. Two more cantos and two stanzas were published in 1596, leaving the poem unfinished. The first two books are those usually read and give the best idea of the beauty of the poem, which places him in the first rank of English poets. Of his other poems, *Colin Clout's Come Home Again* perhaps is the best known. In 1598, after returning from London to his Irish home at Kilcolman Castle, in an insurrection his home was burned, and he fled with his family to London, which he reached exhausted and destitute. There he died soon after at a tavern in King Street, Jan. 13, 1599. He was buried beside Chaucer in Westminster Abbey. See *Spenser and His Poetry* by Craik and *Spenser* by Church, in the English Men of Letters Series.

Antheridium of a Fern discharging the Coiled Multiciliate Sperms.

Sperm (in plants), the male cell which unites with the egg in the process of fertilization. Antherozoid and spermatozoid are terms applied to the

same body. In all groups of plants, except the seed-plants, the sperm is chiefly a ciliated, free-swimming cell. In *Thallophytes* the cilia are variously disposed. In *Bryophytes* each sperm has a pair of cilia at its anterior end. In *Pteridophytes* the body of the sperm is large and spirally coiled, tapering into a long, slender beak which bears numerous long cilia. In *Spermatophytes* ciliated sperms do not occur, except in Cycads and Ginkgo, the male cells being transferred through pollen tubes.

Spermaceti (*spĕr'mȧ-sē'tĭ*) is a waxy substance obtained from the oil found in the head of a sperm-whale. The oil in the head of an ordinary-sized whale will fill 12 barrels. The oil is drained off, and the spermaceti washed with hot water and weak boiling lye. It is a white substance, looking like wax, without taste and with very little odor. It is used for candles and in medicine.

Sper'mary, the male organ of plants, that is the organ which produces the sperms. It is the same as *Antheridium* (*q. v.*), but is substituted for it by those who wish to emphasize the fact that an antheridium holds no relation to the anther of flowering plants.

Spermatophytes (*spĕr'mȧ-tō-fīts*), the highest of the four great divisions of the plant-kingdom, characterized by the production of seeds. The name means seed-plants. This great group has received numerous other names, as flowering plants, Anthophytes, Phanerogams, Phænogams, Phenogams, Siphonogams etc. The seed-plants form the most conspicuous vegetation on the earth's surface, and are the plants most usually noticed. They have been evidently derived from *Pteridophytes*, differing from them chiefly in the production of seeds. The condition which has resulted in the formation of a seed is the presence and retention of a single megaspore (embryo-sac) in the megasporangium (ovule). The two great lines of spermatophytes are gymnosperms and angiosperms. In gymnosperms (naked seeds) the ovules and seeds are exposed upon the face of the open scale, as in pines, spruces, cypresses, junipers etc. In angiosperms (inclosed seeds) the ovules and seeds are inclosed in an enveloping carpel or group of carpels. The gymnosperms are a very ancient race, being represented only by about 400 living species; while the angiosperms are modern, containing more than 100,000 described species. See GYMNOSPERMS and ANGIOSPERMS.

Spermatozoid (*spĕr'mȧ-tō-zō'ĭd*) (in plants). See SPERM.

Sperm-Whale. See WHALE.

Sphagnum (*sfăg'nŭm*). A genus of mosses known as the bog-mosses. They are large and pallid forms, which occur in great masses in boggy regions, especially at the north. The sphagnum-bogs are great peat-formers, and associated with the sphagnums are many strange seed-plants, as carnivorous plants, the rarer orchids, heaths etc. This association of plants of strange habits seems to be due to the fact that the waters of the bog are poor in nitrogen-containing salts, and only those plants which have learned to endure such conditions are found. The genus sphagnum is so peculiar that it forms one of the two great groups of mosses, the other and much larger group being called the true mosses. Sphagnum is an intermediate form, combining characters which belong to liverworts and true mosses. See MUSCI.

Sphinx, The. The sphinx at Gizeh, the oldest of known statues is a colossus having the head of a man and the body of a lion. It is chiseled from the living rock, 1,800 feet distant from the great pyramid. Some say it was hewn by the Hor-shesu, servants of Horus, before the reign of King Mena of the first dynasty and was in need of repair at the time Khufu built the great pyramid. The sphinx faces east that he may be the first to catch sight of Ra, his father, the rising sun. It was known to the ancient Egyptians as Hu or Seheps, and to the "sons of the desert" it was Abul-Hoe (father of terrors). Binion, in *Ancient Egypt or Mizraim* gives the measurements as follows: Height of head from top of head to bottom of chin 19 ft.; horizontal diameter on level of forehead 23 ft; circumference at level of forehead 72 ft.; horizontal diameter near broadest part of wig 29 ft.; circumference near broadest part of wig 91 ft.; height of neck 5 ft.; horizontal diameter 22 ft.; circumference of neck 69 ft.; total height, present state (Bey) 65 ft.; ear 6 ft. 5 in.; nose 5 ft. 10 in.; the mouth 7 ft. 8 in.; face, widest part across, 13 ft. 7 in.; whole length of body 140 ft.; outstretched paws 50 ft. The execution of this masterpiece shows the product of a mature people; of a nation that had been in development for generations and generations. Notwithstanding the devastation that has befallen this powerful statue — the lower part of the head-dress fallen; the neck diminished until the massive head seems almost to totter on the verge of downfall; the nose and head broken off by fanatics; and the paws and breast that were restored by the Ptolemies and the Caesars also in a state of decay — it still is rapt in profound thought and tranquillity behind which great strength and power seem to live in perfect command. G. Maspero, in speaking of the great sphinx in his *Manual of Egyptian Archæology*, says: "The art which conceived and carved this prodigious statue was a finished art, an art which had attained self-mastery and was sure of its effects."

Other sphinxes are found in Egyptian ruins of a later date during the age of temple-building, and are much smaller and of three kinds, namely, androsphinx, which

has the head of a man; criosphinx, the head of a ram; and hieracosphinx, a hawk's; yet all have the body of a lion. These were employed along the avenues leading to temples and along the passages that joined together the sacred fortresses which usually outnumbered the temples in every city and were used as the last resort in an attack from enemies. Consult Maspero's *Manual of Egyptian Archæology;* Binion's *Ancient Egypt or Mizraim;* and Hamlin's *History of Architecture.*

Spice Islands. See MOLUCCAS.

Spices, certain vegetable substances, used for flavoring food. They are the product usually of tropical countries, and are brought mainly from the east, though some are found in the tropical regions of America. They come from different parts of the plant, as ginger from the root, pepper and nutmeg from the fruit, cinnamon from the bark, and cloves from the bud. Ginger, cultivated in the East and West Indies, is prepared for the market by scalding the roots in boiling water or by scraping the roots and then washing. The first process makes white ginger, and the last black ginger. Preserved ginger is the young rootstocks preserved in syrup. Nutmeg and mace are obtained from the fruit of trees or shrubs native to Asia, Madagascar and America. Nutmeg is the kernel or seed of the fruit, which is yellow and looks like a pear that is somewhat round, and has rather hard flesh. Around the nut is a network of fibers called mace, and within the thin brown shell is the nutmeg. The mace is blood-red when fresh, but when dried in the sun turns a light brown. It is sprinkled with seawater to preserve it and pressed flat. Both mace and nutmegs yield an oil and are used in medicine as well as in food. The trees do not bear fruit until eight or nine years old. Cinnamon is the inner bark of the cinnamon-tree. The tree is a native of Ceylon, and grows also in China and South America. The bark is taken from the tree in strips about 40 inches long, and gathered into bundles, which makes it ferment so that the outside bark is easily peeled off. It is dried, and rolled up. The best cinnamon comes from Ceylon. Cloves (called so because they look like small nails, from *clavus*, the Latin for nail) is the flower-bud of the clove-tree. The tree is a native of the Moluccas, grows about 40 feet high, and lives to be 100 or 200 years old. The spice is the blossom, and is gathered before it is quite open and dried in the shade. The tree does not grow well out of its native soil. The oil of cloves is used in medicine. Pepper is a berry which grows on a climbing shrub. It is about as large as a pea, and there are 20 or 30 in a cluster. They are yellow when ripe, black when dried. Black pepper is made by grinding the whole berry, white pepper by rubbing off the outer covering before grinding. Cayenne pepper is the pod of a plant, and was first brought from Cayenne in South America. Mustard is obtained from the seeds of a plant, three varieties of which are used — the black found in Europe, the white in Europe, Asia and the United States, and a weed, called the wild mustard, found in England and the United States. The seeds of the wild mustard are used only to mix with the others. The flour made from the seeds is often adulterated, but mixing it with wheat-flour is allowed, as it keeps better and is less bitter and stinging.

Spi'ders, a distinct group of animals related to scorpions, daddy-long-legs and mites. United with the latter, they make the class *Arachnida*, which is related to the classes of insecta, crustacea and myriopoda. Their body is separated into two parts, a combined head and thorax and an abdomen. There are four pairs of walking-legs on the thorax, which distinguish them from all insects, the latter having three pairs of legs. The head carries poison-jaws, mouth-parts and, usually six or eight simple eyes. The arrangement of the eyes is an aid in classifying spiders. They breathe by means of air-chambers on the abdomen, which are called lungs. These number two or four, and, when the former, there also are air-tubes in the body. The spinnerets from which the thread is spun are little knob-like processes on the under side of the abdomen near its tip. There are two, three or four pairs with numerous horny tubes opening upon them. The substance of the thread is fluid and hardens on contact with the air. It is formed within numerous glands, one of which opens in each horny tube. Fluid issues from the various tubes and is usually united into a single thread. Some spiders, in place of spinning webs, send into the air a slender thread which becomes longer and longer, and, finally, is sufficient to act as a float. They let go their hold and go sailing through the air often for miles, supported by this floating thread, and ballooning spiders sometimes are seen far out at sea. Spiders lay eggs in silken bags or cocoons, which are sometimes carried about by the female and at other times attached to objects in sheltered places. The young that hatch from the ball dragged by the mother climb up her back, and for a time she thus carries them about. The kinds of spiders and the webs they form are varied. The cobweb of the house-spiders is most familiar, though there is a much larger number of webs to be found out-of-doors. The common garden-spider with its geometrical web is well-known. The large black and yellow spider is frequently seen in the autumn. The interesting jumping-spiders are common on plants, logs, fences and sides of buildings. The common grass-spider makes its web in the

CRAB SPIDER

form of a funnel in the grass. Some spiders of small size build no webs, but wander about and leap upon their prey like tiny tigers. The trap-door spiders inhabit tubular nests in the ground provided with a trap-door to close the entrance; several species are found in our southern and southwestern states. Some triangular spiders, with sharp spines projecting from their bodies, are among the most curious forms. Among the largest spiders of warm and tropical countries is the tarantula (*q. v.*), a large, hairy, fierce-looking spider whose bite is poisonous but rarely, if ever, fatal to man. All have poison-glands, but very few are harmful to man. There also are crab-spiders (*mygale*), measuring six or seven inches across, which prey upon birds and other small animals. Some of these inhabit our western plains and others are found in tropical regions of the Old World. The king-crab is usually regarded as belonging to the same group as the spiders. See McCook: *American Spiders and Their Spinning Work* and Emerton: *The Common Spiders of the United States*.

Spike, an inflorescence in which the flowers are sessile, or nearly so, and upon an elongated axis. See INFLORESCENCE.

Spike'let, small spikes which form a part of a larger inflorescence, as in grasses. See INFLORESCENCE.

Spikenard (*spīk'nārd*) or **Nard,** a perfume obtained from a small plant, a native of India. It was much prized by the ancients and used in baths and at feasts. The odor is not generally liked by modern nations, and it is now used more in medicine than as a perfume. Some other plants of the same order, used in the place of spikenard, grow on the Alps and other mountains of southern Europe, where the peasants gather them from the rocks.

Spine, a rigid, sharp-pointed outgrowth from plants. Ordinary spines are modified branches and sometimes leaves, which have become stunted on account of deficient food-supply. They are most common in plants of arid regions. Sometimes, however, hairs become very rigid and sharp, in which case they are said to be spiny.

Spin'ner, Francis Elias, an American official, was born at Mohawk, N. Y., in 1802. He was in Congress from 1855 to 1861, but is best known as treasurer of the United States for 14 years. In this capacity his signature was placed on all the paper-money of the United States, and the very curious autograph, defying imitation, was known all over the world. He retired in 1875, and died on Dec. 31, 1890.

Spin'ning, an old-time household industry, performed by the hand, by means of the spindle and distaff, but now a process extensively performed by machinery, and consisting of drawing out and twisting into thread wool, cotton, flax, silk and other fibrous substances, suitable for sewing purposes or weaving. The operation was first performed mechanically by the spinning-machine or jenny, invented in England about 1767 by James Hargreaves (*q. v.*), a Lancashire weaver, by the operation of which a number of threads were spun together. To this spinning-jenny was later on invented and attached a bobbin for winding the yarn by a motion separate from that of the spindle. Still later the jenny was followed by the spinning-frame and the spinning-mule, which ultimately superseded the jenny in cotton manufacture. In England Manchester is the chief seat of the spinning and cotton-making industry; while in America there are now not less than 25 million spindles in operation in the great textile factories spread over, chiefly, the eastern portion of the United States.

Spinola (*spē'nō-lā*), **Ambro'sio,** Marquis of, a great Italian soldier, was born at Genoa in 1571. With his brother he raised a force of 9,000 men whom he kept at his own expense. He served first in the Netherlands. His reduction of Ostend, which had been besieged two years, gave him a great reputation, and he was placed at the head of the Spanish and Italian troops in the Netherlands. His great antagonist was Prince Maurice of Nassau, and in their long struggle neither could gain any advantage. After an armistice of 12 years, beginning in 1609, with the renewal of the war Spinola was once more opposed to Maurice, who died, however, before the walls of Breda. The taking of Breda in May, 1625, after a siege of ten months, was Spinola's last victory. He had spent his fortune in maintaining his troops, but his claims were not acknowledged by the Spanish government, and vexation from this shameful neglect is said to have hastened his death, which took place in Piedmont, Sept. 25, 1630.

Spinoza (*spĭ-nō'zā*), **Ben'edict,** the great Dutch-Jewish philosopher, was born at Amsterdam, Nov. 24, 1632, of Hebrew parentage. His philosophical studies gradually drew him away from the faith of Israel, and he was formally excommunicated in 1656, when he changed his name, which was Baruch, to Benedict. In common with all Jewish youth he had been taught a trade, in his case that of polishing lenses, by which he now supported himself. At the death of his parents he contested with his sisters his right to the inheritance, but, when he had obtained it, took only one bed. He moved to Leyden and then to The Hague, where he was offered a professorship at Heidelberg, Germany, if he would teach nothing opposed to the received religion. He declined the position, the offer of money by a wealthy friend and a pension, conditioned on dedicating

one of his works to Louis XIV. Yet he was living on only a few cents a day. Separated from his friends, suffering from ill-health and want and harassed by continual persecution, he continued his life of study until his death on Feb. 21, 1677. His philosophical system was based on that of Descartes, and is mainly contained in his *Ethics*, which was not published until after his death. "The world has produced no intellect more profound than that of Spinoza, and Spinoza has produced no book which can be compared with his *Ethics*," which attracted the admiration of such men as Goethe, Fichte, Schelling and Hegel and gave character to a school of philosophy. During his life Spinoza published only two works: *Abridgement of the Meditation of Descaries* and a *Treatise on Theological Politics*. Consult H. Smith's *Spinoza and His Environment* and the *Life* by Pollock.

Spi'rea, a genus of plants of the rose family. The species scattered throughout the temperate parts of the northern hemisphere consist of small, unarmed shrubs or perennial herbs, with racemes or corymbs of white or reddish flowers. North American, Indian and Japanese shrubby species are in cultivation. Two very fragrant British species are known by the name of meadow-sweet. Dropwort, found in Sweden, has tuberous roots which are somewhat nutritious and are ground and made into bread. Hardtack, a species in the United States, is used as a tonic and astringent.

Spirogyra (*spī'rō-jī'rȧ*), a genus of plants belonging to the green algæ, which has received its name from the fact that the very conspicuous chloroplast passes as a broad spiral band from one end of the cell to the other. The species are filamentous forms, and are very common in frothy masses in stagnant fresh water and about springs, being commonly known as pond-scums or frog-spittle. Spirogyra belongs to the conjugate forms, its filaments becoming connected in pairs by outgrowing tubes at the time of fertilization. See CHLOROPHYCEÆ.

Spitzbergen (*spĭts-bĕrg'en*), a group of islands in the Arctic Ocean, 400 miles north of Norway. They are covered with ice, with sharp projecting peaks, which give them their name of Spitzbergen, meaning Needle-like Mountains. On the western coast the climate is affected by the Gulf Stream, while the eastern coast is icebound and difficult of access. There is a scanty vegetation, with 40 species of plants; herds of reindeer, the arctic fox and the polar bear are found, with great swarms of seafowl. The longest day is four months, and the long night lasts from Oct. 22 to Feb. 22, in which the moon and stars and occasionally the *aurora borealis* are the only light. There are no permanent inhabitants, but the islands are visited by Norwegian walrus-hunters and scientific explorers. Consult Lord Dufferin's *Letters from High Latitudes*.

Spof'ford, Ainsworth Rand, a librarian of the United States Congress, was born at Gilmanton, N. H., Sept. 12, 1825, and educated by private tutors. Early in his career he settled at Cincinnati, O., as a bookseller and publisher, and also became associate-editor of the Cincinnati *Daily Commercial*. In 1861 he became assistant to the librarian of Congress, and four years later was appointed librarian-in-chief. In 1897 he was succeeded by J. R. Young and later by Herbert Putnam. Mr. Spofford was an indefatigable compiler of the catalogues of the Congressional library, and for some years issued the *American Almanac*. He also interested himself in copyright matters, published a *Manual of Parliamentary Rules*, and edited the *Library of Choice Literature*, the *Library of Historic Characters and Famous Events* and the *Library of Wit and Humor*. He was one of the greatest librarians that ever lived and a marvel of learning and memory. He died on Aug. 11, 1908.

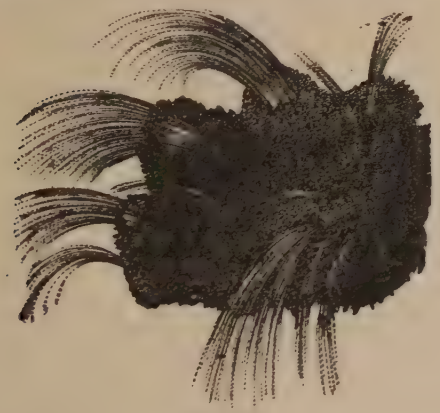
Spofford, Harriet Elizabeth (Prescott), an American author, was born at Calais, Me., April 3, 1835. *In a Cellar*, one of her first contributions to the *Atlantic Monthly*, attracted great attention. She has since published *The Amber Gods; Sir Rohan's Ghost; New England Legends; Azarian, an Episode;* and still is a frequent and popular contributor to the periodicals.

Spokane (*spō-kăn'*), **Wash.,** formerly called Spokane Falls, a city in the eastern part of the state, is the county-seat of Spokane County and is reached by the Northern Pacific, Great Northern, Oregon Railway and Navigation Company and Spokane and Northern and other railways. Spokane River, which runs through the city, is spanned by 23 bridges, and in a series of falls has a descent of 142 feet, affording splendid water-power. Even at extreme low-water these falls develop 15,000 electrical horse-power. This is utilized in numerous manufacturing plants and in generating electric power, which not only serves the city but is furnished to mines in Idaho, 100 miles distant. The famous silver-lead mines of Cœur d'Alene, Idaho, which produce over one fifth of the annual lead output of the world, are thus operated. This water-power lights the city, operates the mills, 98 miles of street-railways and 258 miles of interurban lines. Spokane is the mining-center of a wide region, and does a large business in handling the products of the mines and in furnishing miners' supplies. It is surrounded by heavy pine-forests, which produce a large output of lumber and make the city an important lumber-market. It also is the chief market

SPONGES SPREAD ON WHARF TO DRY

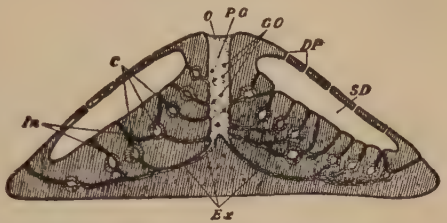
for the extensive grain-products of eastern Washington. The adjacent country is also rich in farm and dairy products, fruit and live stock, and has valuable quarries of granite. The manufacturing interests include lumber and lumber-products, machine-shops, foundries, flour-mills, cigars, crackers, soap, flour-mills, machinery-works, pottery, mattress, furniture, broom and trunk factories, a cereal-food plant and brick and terra-cotta works. Spokane is a substantial and admirably built city, as regards both residences and business blocks. Some of the notable buildings are the city-hall, Carnegie Library, the county court-house, St. Luke's Hospital, Masonic Temple, August Paulsen Building, Marshall-Wells Building and Columbia Building. There are more than 70 churches, and the educational facilities are of the best. The 23 brick and stone school-buildings cost over $1,500,000, and the high school $175,000. It is the seat of Gonzaga College (which cost $500,000), Academy of the Holy Name, Brunot Hall for Girls and St. John's School for Boys. Spokane has all the facilities of a thriving modern city, owns its own water-works, and has good drives and parks. The first settlement was made in 1872, the city incorporated in 1881, and now has a population of 104,402.

Spon'ges, a group of animals intermediate between the protozoa (which see) and ani-



SPONGES

mals like the hydra and jelly-fishes (cœlenterata). The sponges were formerly regarded as plants, but that was in the days when superficial appearances only were considered. They are distinctly animals, and are usually separated into a distinct sub-kingdom called porifera. Although they have no distinct organs, they are clearly a step above the simplest animals. They are many-celled animals and are composed of two distinct layers. The middle layer (mesoderm) is foreshadowed in them, but is not distinctly developed. All animals above them have three distinct cell-layers. Sponges are mostly marine, but a single genus (*spongilla*) of fresh-water sponges is widely distributed, being abundant in the region about Chicago, as well as in other parts of the United States. These fresh-



Vertical section of a fresh-water sponge(*spongilla*), showing the arrangement of the canal system. C. ciliated chambers; DP. dermal pores; Ex. excurrent canals; GO. openings of the excurrent canals; PG. paragastric cavity; SD. subdermal cavities; O. osculum.

water sponges are not often noticed by the casual observer. They are clusters of soft, greenish substance looking like algæ. They will, however, shrink when touched, and, if closely watched, a current of water can be seen coming from a crater-like opening in their top. Minute points of lime are formed within their substance to serve as a support. They increase by budding and by eggs that are formed in the autumn, and carry the life over to another season. The marine sponges are varied in form, size and complexity. Their skeletons are either limy, flinty or horny. The bath-sponges and slate sponges represent the horny skeletons only. When they are living, the skeleton is covered with sponge-flesh, and they look on the outside something like a piece of liver, or like a piece of tanned kid, but always with some pores opening into them. The limy sponges and the glass-sponges are too hard for commercial use. The sponges are all permeated by branching canals which open by small pores on the surface. These canals lead into larger ones, and, finally, open into chimney-like passages which open outward by an orifice of considerable size. Water carrying oxygen and minute food-particles is continually passing in through the small surface-pores, traversing the system of canals, and passing out through the crater-like opening. Along the passage-way are rounded chambers which are lined by numerous cells provided with flagella. These cells do the feeding. The flagella are hair-like threads of protoplasm that keep waving and help to produce the currents of water. The simplest sponges are small tubes with many inlets and a single outlet. The more complex sponges have the passage-ways very much branched and usually several outlets. Sponges increase by budding and also by the formation of eggs. The sponges of the Gulf of Mexico, the

Bahama Islands and the West Indies are of a rather coarse quality. The finest sponges come from the Mediterranean and the Red Sea. Sponges of good quality are found in Florida waters, the best variety, sheeps-wool, selling for $2 to $5 per pound. Sponge-fishing has there become an important industry, employing nearly 200 small vessels, with crews numbering more than 2,500 persons. When a vessel reaches the grounds, the men go out in pairs in row-boats, one man leaning over and scanning the sea-bottom with a water-glass. When a sponge is seen, it is secured with a kind of steel fork on a long, slender pole. The flesh is removed, sometimes by imbedding in the sand, and the skeleton is left. They are then soaked in water, and afterward squeezed and dried in the air. See Hyatt's *Commercial and Other Sponges.*

Sponta'neous Combus'tion, or burning without the application of fire, sometimes occurs in mineral and other substances. Charcoal, if saturated with oil, may become so heated as to burn, and coals containing iron pyrites, when wet, will catch fire. Phosphorus, when dry, ignites easily, and has been known to melt and burn in a room where the temperature was only 70°, so that in hot weather a fire may be started by large packages of matches. Hay, cotton, tow, flax, rags, straw, leaves, if collected in large quantities, when damp undergo fermentation, which gives off sometimes enough heat to burn. The cotton-rags and waste used in wiping oiled machinery and lamps have probably started many unexplained fires. Spontaneous combustion of the human body has been thought to occur in a number of cases, usually where the individual was an habitual drinker, but is now considered doubtful. Liebig says a dead body filled with alcohol may burn of itself, but not a living one, in which the blood is circulating. See *Letters on Chemistry* by Liebig.

Spontaneous Genera'tion of Life, the doctrine that life in some form is developed from non-living matter. The ancients believed that frogs and eels sprang from mud, that insects were generated in dew, that decaying meat bred maggots, that the appearance of other forms of life was to be accounted for by spontaneous generation from lifeless matter. This belief was quite general until the 17th century, when the Italian, Francesco Redi, made experiments to test the truth of it. He placed bits of meat in open jars, and others in jars that were covered by fine gauze, and watched for the development of maggots. The blow-flies visited the uncovered meat, but were prevented from reaching the other. Of course, maggots hatched from the eggs, but did not appear in the protected meat, and, by this simple experiment, he proved that maggots did not arise spontaneously from the meat. This was about 1660. He made further experiments and reached the conclusion, not as a matter of opinion, but as a result of experiment, that life arises only from antecedent life and does not develop spontaneously.

This position was quite generally accepted for larger animals, but with the introduction of the microscope, a new world of extremely minute living beings was made known, and doubts began to be entertained that those minute beings must always have parents like themselves. It is a well-known fact that fluids, like clear mutton-broth or water, in which any vegetable or animal substance has been soaked, will, if allowed to stand, soon become teeming with microscopic life. The possibility of this life arising by spontaneous generation formed a new phase of the question. Needham and Buffon attempted to put the matter to test by boiling infusions, to kill all germs that might exist in them, and corking them tightly. In course of time these fluids became cloudy and were overrun with microscopic life. But about 1775 a priest of the period named Spallanzani, showed that their experiments had not been conducted with sufficient care. He boiled infusions for three quarters of an hour in flasks, and, while the fluid was still boiling, heated the necks of the flasks and, drawing them into a fine point, he closed them by heat. No microscopic life appeared in the flask treated in this way, and the conclusion was drawn that spontaneous generation of life was disproved.

About this time oxygen was discovered and shown to be necessary to all forms of life. This brought a new point of view, and objection was made to Spallanzani's form of experiments on the score that oxygen was excluded by sealing the necks of the flasks. In order to test this objection, Schulze and Schwann in 1836 took up the question again and devised a means of admitting oxygen into the flasks containing fluids that had been boiled. The necks of the flasks were drawn out long, and convoluted, and left open at the ends. In some cases the inlet was heated and air drawn in. In other cases the air was passed through bulbs containing chemicals that did not alter the oxygen. It was soon discovered that a plug of cotton-wool in the necks of the flasks would act as a filter. It permits the air to pass through and arrests all floating particles and, therefore, does not allow dust or germs to pass through with the air. A flask, or test-tube, is partly filled with an organic infusion; the latter is boiled and, while boiling, a plug of cotton-wool is pushed into the mouth of the vessel. On cooling, the air passes through this plug, but the smallest solid particles are caught in the meshes of the cotton-wool. Organic fluids treated

in this way have been known for years to show no sign of microscopic life.

The question was regarded as settled, but in 1859 it was unexpectedly opened in Paris by Pouchet, who claimed that life was developed in organic fluids even after boiling and preventing the entrance of floating particles from the air. Pasteur, however, demonstrated that Pouchet had been careless, and had admitted solid particles to the flask in the mercury, through which the oxygen had been introduced into the flasks. This closed the question as far as it could be answered by experiment. Professor John Tyndall added something to the certainty of the matter by an ingenious experiment. He had an air-tight box made with glass-windows, through which he passed a strong beam of light in a darkened room. The floating particles in the air, contained within the box, fell of their own weight, and came to rest on the sides and bottom of the box, which had been smeared with a sticky substance to hold them. He could tell when the air was completely cleared of these particles by his beam of strong light, because any minute floating particle would become illuminated and reflect the light. When they had entirely come to rest, he called the air "optically pure." Through the bottom of this box he had inserted a number of test-tubes with their mouths opening into the chamber, and, by means of a long funnel and a hole pricked in a rubber membrane at the top, he was able to introduce a variety of organic fluids into these test-tubes. The ends of the test-tubes outside of the box were now inserted into boiling oil and all germs of life that might be contained in the fluids were completely killed. He was able to expose the fluids in these open test-tubes to the optically pure air for months, without any appearance of microscopic life in any of them. To demonstrate that the fluids were capable of supporting such life, he had simply to open for a moment an air-tight door in the back of the chamber and admit some of the outside air. When this was done, the fluids became turbid in a short time, and were teeming with microscopic life. Thus it was demonstrated that microscopic life came from floating germs in the air, and is not spontaneously generated in organic fluids. See Tyndall in *Pop. Sci. Mo* (vol. 12, 1878) and in *Floating Matter of the Air.* WILLIAM A. LOCY.

Spoon'bill, the name of birds related to the Ibises, having long, broadly expanded bills, more like paddles than spoons. They belong chiefly to the eastern hemisphere, where there are six or seven species. The European spoonbill is a white bird about 32 inches long. It breeds in Holland and other parts of Europe. The roseate spoonbill is the only American species. It is abundant in the tropics and also breeds in the southern United States. These birds inhabit marshes, muddy borders of estuaries and small sea-islands overgrown with bushes. They are from 28 to 35 inches in length, of a beautiful rose-color, deepest on the wings, fading to almost white on the neck, back and breast. Their tail-coverts are deep carmine. They feed at night by gathering insects and shell-fishes from the mud in shallow water. In the breeding season they congregate in large numbers.

WHITE SPOONBILL

Sporangium (*spō-răn'jĭ-ŭm*), an organ of plants which produces asexual spores. In the thallophytes a sporangium is usually a single cell; but in the higher plants it is a many-celled organ. The sporangia of ferns and the pollen-sacs of seed-plants are illustrations of many-celled sporangia. In heterosporous plants sporangia become differentiated, the microsporangia producing microspores, and the megasporangia producing megaspores. In seed-plants the pollen-sacs are microsporangia, and the ovules are megasporangia.

SPORANGIUM OF A MOULD

Spore, a plant-cell specially set apart for reproduction. Spores have received the greatest variety of names in different groups of plants, but they may all be reduced to two great groups. Asexual spores are those which are formed by the division of a cell, or at least are not formed by the union of cells; while sexual spores are those which are formed by the union of two sexual cells, called gametes. These two types of spores do not differ from one another in power, but in mode of origin. The sexual spore has received the general name of oöspore; but in plants in which the pairing gametes are similar it is more frequently called a zygospore or zygote. The asexual spores have received very many names. Among the green algæ the characteristic asexual spore is a ciliated, free-swimming cell, and is called a zoöspore or swarm-spore. Among fungi, asexual spores have received such names as conidia, ascospores, uredospores, teleutospores, æcidiospores, basidiospores etc. Among bryophytes and pteridophytes they are known simply as spores. When heterospory is introduced, they become microspores and megaspores; and in spermatophytes they are known as pollen-grains and embryo-sacs. Such a

multiplicity of names for the same body is very confusing at first, but when the terms are learned they are very convenient in designating either the group or method of origin of the spore referred to.

Sporogonium (*spō-rō-gō'nĭ-ŭm*) (in plants), the leafless sporophyte of mosses, as distinguished from the leafy sporophyte of ferns and seed-plants. When highly organized, it consists of foot, seta and capsule; and its sole function is the production of spores. See MUSCI.

Sporophore (*spō'rō-fōr*) (in plants), a special branch which bears spores. Used chiefly among the fungi, where special spore-bearing branches arise from the mycelium. See FUNGI.

Sporophyte (*spō'rō-fīt*). In alternation of generations (which see) among plants the generation which bears the asexual spores is the sporophyte, as distinguished from the generation which bears the sex-organs and produces the sexual spore, called the gametophyte. In the mosses the sporophyte is the leafless sporogonium (which see), consisting chiefly of a spore-case (capsule) on a stalk. In the ferns and seed-plants the sporophyte becomes the conspicuous leafy part of the plant, in fact the whole plant of ordinary observation. It is of interest to note that the sporophyte is essentially sexless, and that to speak of "flowers," structures produced by the sporophyte, as having sex-organs, is very far from the fact.

Spottsylva'nia Court House, a small village in Virginia, 55 miles northwest of Richmond. It is known as the scene of one of the desperate battles of the Civil War, fought between Lee and Grant, May 10, 1864. When Grant was driven back, with terrible slaughter, he wrote to the secretary of war the famous message: "I propose to fight it out on this line, if it takes all summer." On the 12th the attack was renewed, and the next day Lee, suffering from heavy losses, withdrew to an inner line of intrenchments, from which Grant could not drive him but moved around him on his way to Richmond.

Spray'ing-Mixtures are intended to be applied in liquid form by means of spraying-machines to trees, small fruits, vines, flowers and vegetables to prevent the ravages of fungous diseases and insects. Fungicides and insecticides may, in many cases, be applied dry as well as in solution, as the Bordeaux mixture, Paris green etc. Fungicides much used are the popular Bordeaux mixture (*q. v.*) and ammoniacal solution of copper-carbonate. The latter contains copper-carbonate, five ounces, made into a paste by adding one and a half pints of water, aqua ammonia of 26 degrees strength and 45 gallons of water. This preparation is clear, and is not so easily noticeable on the plants as are the preparations containing lime. Insecticides for spraying are of two sorts, depending upon the general division of injurious insects into the classes of biting-insects and sucking-insects. Biting-insects, those with jaws for chewing foliage, fruit etc., will also eat the poison on their food; hence the arsenical poisons are most generally used for this class of insects, examples of which are grasshoppers, potato-beetles and other beetles. Sucking-insects have bills that penetrate the plant-tissues, as of the stem, and so are not affected by poisons on the surface. Examples are plant-lice, scale-insects and squash-bugs. They mostly have soft bodies and are fought with soap-kerosene emulsions, designed to coat their bodies and suffocate the insects by excluding the air from the breathing-pores scattered over their skin; for these animals do not breathe through an opening in the head. The lime-sulphur wash is widely used for scale-insects in orchards. The larva or caterpillar stage of flies, beetles, moths and butterflies have both soft bodies and jaws for chewing, and so can be fought by either kind of antidote. The best known of the first class of insecticides are Paris green, London purple and white hellebore. Paris green is composed of copper oxide, acetic acid and white arsenic (arsenious oxide), and should contain at least 50% of the last-named ingredient. Paris green should be mixed with quick-lime to render insoluble any free arsenic, which is poisonous to plants, at the rate of one pound of each to each 100 or 300 gallons of water. The mixture should be strained, and constantly stirred while using. London purple is less reliable, on account of the larger amount of soluble arsenic and the variability of its composition. The lime-sulphur wash is composed of unslaked lime 20 pounds, flowers of sulphur 15 pounds and water to make up from 45 to 50 gallons.

The concentrated stock-solution of kerosene-emulsion is composed of hard soap in fine shavings or even of soft soap one half pound, rain-water one gallon, kerosene (sometimes called coal-oil) two gallons. The soap-solution is brought to a boil, poured into the kerosene, and churned vigorously. Dilute for use with 10 to 20 volumes of water. A diluted decoction of tobacco-stems is good for spraying house-plants and garden-vegetables. While not exactly a spraying solution, carbon bisulphid is much used for pests living around the roots of garden-truck. It is a highly inflammable liquid with a very disagreeable odor, and, when poured down a small hole near the base of the plant, it drives away cut-worms and similar pests. Consult Lodeman's *Spraying of Plants*, Weed's *Insects and Insecticides*; and bulletins of the state experiment-stations and of the U. S. Dept. of Agriculture.

Spring'bok, a species of antelope found most abundantly in Africa. It is a beautiful creature, larger than the roebuck, brown above and white underneath. The head is white, except a broad band of brown on each side of the eye to the mouth and a brown spot in the middle of the face. Its name comes from the great leaps it makes, springing into the air from seven to 12 feet. It lives on sandy plains, but great herds will travel to more fertile regions. A traveler describes a vast herd seen by him, pouring through an opening in the hills, a living mass half a mile in breadth and taking hours for the passage. It is growing scarce, though still abundant near Zambezi River.

Spring'field, Ills., the capital, is in Sangamon County, a short distance southwest of the center of the state; and, according to the latest census, had a population of 51,678. The first settlement was in 1818, and in 1821 the town was made the county-seat. In 1837 the capital was removed to this place, and a state-house erected. The present capitol, begun in 1868, first occupied in an unfinished condition in 1876 and completed in 1885, cost $5,000,000. The surrounding country is a rich agricultural region, the chief products being corn, oats, wheat, hay, fruits and vegetables. Cattle, hogs and horses are raised extensively. Bituminous coal is mined in large quantities around the city, and is one of the leading products. During the year ending July 1, 1900, 2,519,511 tons of coal were mined in the county, and four fifths of this amount shipped by rail to other parts of the country. The principal articles manufactured here are iron, steel, steam-engines, boilers, agricultural implements, brick, watches and woolen goods. It is a railroad center, main lines of the Wabash; Alton; Illinois Central; Baltimore and Ohio Southwestern; and other roads passing through it, besides a number of interurban electric lines.

The city has a very efficient public-school system. There are 15 buildings, one for high-school purposes with a capacity for 800 pupils, and 14 other buildings for primary and grammar schools. The school enrollment has reached 7,500. Besides, there are colleges and many private schools. Springfield is of historical interest on account of having been the home of Abraham Lincoln. The house in which he resided, when elected president, still stands; and in beautiful Oak Ridge Cemetery just outside the city, is a fine monument erected to his memory, where his remains are deposited. The state-fair grounds and buildings, the most extensive in the country, the encampment-grounds and the armory are here.

Springfield, Mass., a city on Connecticut River, 25 miles north of Hartford. It is a well-built city, parts of it elevated, with a fine park. It is noted for its excellent public school system and fine churches, including a cathedral. The United States armory, employing 3,000 men during the Civil War and from 500 to 700 ordinarily, and the arsenal, in which 500,000 stand of arms can be stored, are located here. Springfield's manufactures are numerous, including the Smith and Wesson arms-factory, the Indian Motorcycle Co., Wason Car Co., Barney and Berry Skate Works and gold chain, goldleaf, filter, envelope, hardware, spectacle, thimble, needles, buttons, kindergarten supplies and candy factories. Springfield was settled in 1635 by emigrants from Roxbury and was called Agawam, from the Indian name of a neighboring river. The city was burnt in 1675 during King Philip's war. It is served by six railroads, including branch lines, and splendid civic spirit prevails. Population, 102,103.

Springfield, Mo., a city in southwestern Missouri. It is built on a table-land 1,500 feet higher than St. Louis, and has an important trade. There are flouring-mills and wagon-factories. Drury College was founded here in 1873. Springfield was a trading-post in 1820, and incorporated in 1830; it has two great railroad-plants, one for the Kansas City and Memphis, and one for the St. Louis and San Francisco system. During the Civil War it was held by Federal and by Confederate forces in succession, and the battle of Wilson's Creek was fought near the city, Aug. 10, 1861. Population 35,201.

Springfield, O., a city in the western part of the state, on Mad River, 80 miles northeast of Cincinnati. It is in a fine farming region, and has a large trade in farm-products. With good water-power, manufactories are numerous, especially those of bicycles, piano-plates, iron fencing, steam-engines, road-rollers and farm machinery, including large numbers of mowers and reapers Wittenberg College, opened in 1845 by the Lutheran church, and Springfield Seminary are institutions of higher learning. Located in this city are the state fraternal homes of three orders: Masons, Odd Fellows and Knights of Pythias. Population 46,921.

Springs are the outflow of underground streams. In general they are due to the accumulation of water which has sunk into the ground, until its course has been closed by a layer of impervious rock. In such cases the water must find some outlet. Such an outlet may often occur in a valley or upon a hillside. It occurs in a valley wherever such a valley dips into the ground-water; and on a hillside wherever the percolating water runs along the slope of a bed of rock or clay to the outcrop of the bed. Springs frequently become charged with minerals which have been dissolved in the course of the percolation of the water. The water of hot springs and geysers generally rises from a great depth, whither it has penetrated through a cleft in the start to the warmer

zone below. Artesian wells merely are deepened, artificially assisted springs. Springs that rise from a great depth are generally permanent; but many springs are intermittent; others quite variable. The largest springs may indicate the exit of considerable subterranean rivers.

Spur'geon, Charles Haddon, a celebrated English preacher, was born in Essex, June 19, 1834. He never received a collegiate education, beginning his great work by making religious addresses. In 1850, while living at Cambridge, he entered the Baptist church, preaching his first sermon in a cottage four miles from Cambridge. When only 18 he had charge of a Baptist church at Waterbeach, and the small congregation soon doubled. He went to London in 1854, his church there being twice enlarged to accommodate the crowds that flocked to his preaching, until, in 1861, the great Tabernacle, seating 6,000, was built. At one service in Crystal Palace he preached to 24,000 people. His sermons were issued in weekly numbers and translated into many languages. Besides preaching, he conducted a training-school for ministers, an orphanage and an almshouse, and built 36 churches in London. His publications reached nearly 100 volumes, including several volumes of sermons. He preached without writing his sermons, which were taken down in shorthand as they were delivered, and carefully revised by himself. The weekly circulation averaged 30,000, but that of particular sermons was much larger. He died at Mentone, France, Jan. 31, 1892. See *Life* by Spindler, Dyer etc.

Spy, one employed in war to collect information of the enemy. Spies are always used in regular warfare, and no disgrace attaches to the officers employing them. The dishonor which seems to belong to the person acting as a spy comes probably from the fact that the greater number of spies have been traitors to their country, offering their services freely to the enemy. When a soldier volunteers to penetrate the enemy's lines in disguise, to help his own country and army, it is a brave and honorable act and is so recognized, though the laws of war mete out the same ignominious death to all classes of spies. Major André and Nathan Hale, though hanged, are honored for their devotion and self-sacrifice. The risks of the undertaking have made it attractive to those loving adventure, and many thrilling stories are based upon them, notably Cooper's *Spy*. Political spies are those employed by governments to detect conspiracies. They were used in England in the days of the Tudors and, lately, in Ireland. Bismarck was believed to employ them to a large extent, and Napoleon III had a regularly organized system. Russia has the most perfect arrangements for using spies, both at home and abroad, of any modern nation. See *Secret Service under Pitt* by Fitzpatrick and *The Two Spies* by Lossing.

Squid, an elongated cuttlefish extensively used as a bait by cod-fishers. They are found in nearly all seas and are very abundant on the New England coast. They swim in large schools, following young mackerel and herring, upon which they feed. They in turn are eaten by larger fishes. The common squid ranges in size from six to 18 inches, or even longer. They swim backward by throwing jets of water through the siphon. They have ten long arms provided with suckers, being in this regard similar to other members of the group (cephalopoda). Giant squids, of a different genus, have been taken, measuring 52 feet long, counting the arms. One is reported whose body alone measured 23 feet. See CUTTLEFISH.

Squier (*skwīr*), **Ephraim George,** an American antiquarian author, was born at Bethlehem, N. Y., June 17, 1821. He was for several years an editor, but, becoming interested in the antiquities of the Scioto valley in Ohio, began to make a study of such remains, traveling through the Mississippi valley and New York. He published the results of his work in 1848 in the *Smithsonian Contributions to Knowledge* While *chargé d'affaires* in Guatemala, he made further explorations there, receiving a gold medal from the French Geographical Society for his work. He continued his researches while surveying a railroad-route in Honduras in 1853 and while United States commissioner to Peru in 1863. Among his works are *Nicaragua: Its People, Scenery and Ancient Monuments; Notes on Central America;* and *Peru: Explorations in the Land of the Incas.* He died at Brooklyn, N. Y., April 17, 1888.

Squir'rel, the name for any one of a group of small rodents or gnawing animals. They

SQUIRREL

are found in all parts of the world, except Australia. They are abundant in North

America, but are poorly represented in South America and in Europe. There are two natural divisions of the squirrel family, the ground-squirrels and the tree-squirrels. The latter are graceful, agile animals, with slender bodies and very long, bushy tails. They feed mainly on acorns and nuts, but occasionally eat animal food and birds' eggs. They sit upon their haunches and handle nuts adroitly with their fore feet. They cut through the shell with their sharp teeth. The red squirrel, which represents the common squirrel of Europe, is the smallest and prettiest of our tree-squirrels. It is about eight inches long, and ranges southward from the northern limit of trees. The gray squirrel is one of the best-known species. It reaches a length of about ten inches, and is common east of the Rocky Mountains from Canada to the Gulf of Mexico. It is subject to great color variations, being sometimes black. This tendency for one species to vary in color is common to all tree-squirrels. Other gray squirrels are found in the western parts of the United States. The fox-squirrel is the species found east of the Great Plains. It reaches a length of 12 inches, and has a large tail of about the same length. Tree squirrels have nests both in branches and hollow trees. The latter are also used for food storage and winter homes. The ground-squirrels make burrows, which they also supply with food. North America is the richest of all countries in ground-squirrels. The group includes such forms as woodchucks, prairie-dogs gophers and chipmunks. The latter, called also striped squarrels, are the best known. They stand on the dividing line between the burrowing forms and the tree-squirrels. All have cheek-pouches, in which their stores are carried to their nests. Tree-squirrels are good eating, and the fur of those inhabiting Siberia and Russia is of commercial value.

Sta'bat Ma'ter ("the mother was standing") is a celebrated Latin hymn on the seven sorrows of the Virgin Mary. It has been set to music by many composers, among them Haydn and Rossini. It dates back to the 13th century, and is thought to have been written by Jacopone, a Franciscan monk. It is used by the Roman Catholic church in its services in passion-week.

Sta'dium, originally the Greek measure of length or distance when undertaking a journey; also used by the Romans as a linear measurement. As used at the foot-race course (*stadium*) at Olympia, it indicated one eighth of the Roman mile or a little over 600 English feet. The term has come to be applied to the structures erected on race-courses and athletic fields, from which spectators witness games or contests. The stadium recently restored at Athens and the stadium of Harvard College in the United States are examples.

Stäel (*stä'ĕl*), **Madame de,** a celebrated Frenchwoman, was born at Paris, April 22, 1766. Her maiden name was Anne Louise Germaine Necker, as she was the daughter of Necker (*q. v.*), the French statesman. She wrote romances in her girlhood and a volume of *Letters to Rousseau.* She was married in 1786 to the Baron de Stael-Holstein, the Swedish ambassador at Paris, from whom she separated in 1798, though only to save her fortune from his debts, hastening to his bedside when he died. This marriage made her the center of the brilliant society of Paris, for which she was fitted by her wonderful powers of conversation and her strong enthusiasm and passion. She believed in the Revolution, but hated its horrors, making a vain effort to save the life of the queen and saving Montmorenci and other friends from the guillotine at the risk of her own life. She left Paris in 1792, spending four months in London; "four months of happiness saved from the shipwreck of a life" she called them. In 1797 she returned to Paris, where her great influence made Joseph Bonaparte anxious to win her to his brother's cause by offering to secure for her $4,000,000, which was owing to her father from the treasury. She refused the gift, afterwards accepting it from Louis XVIII. Napoleon hated her; and, finding her *salon* the center of the disaffected party and himself the butt of the brilliant wit of her circle, he banished her from Paris. She went to Weimar, adding to her intimate circle Schiller, Goethe and Schlegel. Her book on *The Influence of the Passions* was published in 1796, and the famous one on *Literature Considered in Its Relations to Social Institutions* in 1800; and after her father's death she wrote his life. Her first romance was *Delphine,* her own story, followed by the well-known *Corinne,* written in 1805, after a sojourn in Italy, which made her name known throughout Europe and revealed Italy to France. Her *Germany* was finished in 1810 and approved by the censorship, but when 10,000 copies had been printed, the whole edition was seized and destroyed by Napoleon's order on the plea that "it was not French." The manuscript had been saved, and the book was published in London in 1813. Her exile now became imprisonment, as she was surrounded with spies, her friends exiled for visiting her, and her walks restricted to a circle of two miles around her home. She escaped to Russia and finally to London, welcomed in the principal cities, not only because of her genius, but as the enemy of Napoleon Under Louis XVIII her old position in Paris was resumed until ended by the return of Napoleon from Elba. In 1811 she had secretly married a French officer, much younger than herself, a marriage acknowledged in her will and made public after her death by her children. She died

at Paris, July 14, 1817, leaving unfinished her *Considerations upon the French Revolution*, published by her children and thought by Sainte-Beuve to be her finest work. See *Life* by Stevens and *Life and Times* by Norris.

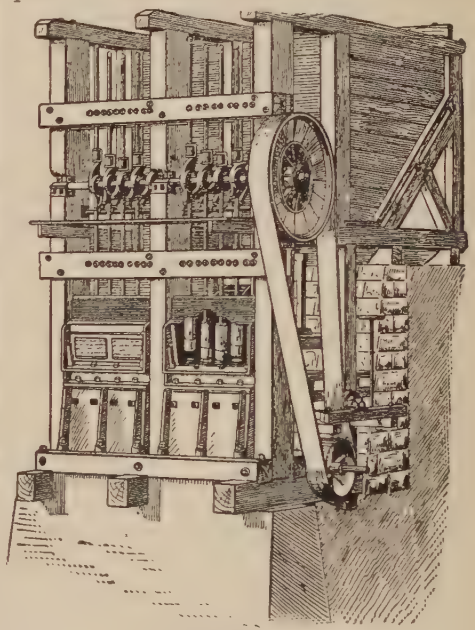
Stag, the male of the red deer which is found all over Europe and in a large part of Asia. It is a noble animal, about seven feet long, and four feet high at the shoulders, with large, branching antlers. It has been driven from inhabited districts, and is now found only in deep forests. In Scotland it is hunted by a form of stalking, but in England on horseback. See DEER, ELK and REINDEER.

Sta'mens, in an ordinary flower the outer of the two sets of sporophylls or sporangial leaves, the carpels being the inner set. Stamens are microsporophylls, and the spores they produce are microspores (pollen-grains). See FLOWER.

Stam'ford, Conn., a city 33 miles northeast of New York, on Long Island Sound. It is a suburb of New York City and a summer-resort for the business men of the city, whose handsome homes are on all the surrounding hills. There are iron and bronze foundries, manufactories of hats, drugs, sashes, blinds and locks. The town was settled in 1641. Population, 34,000.

Stamp-Act, a measure for raising revenue by requiring the use of government stamps on all legal documents used in the British colonies in America. It was passed in 1765, and was resisted by the colonies because they denied the right of the English Parliament to tax them without representation; that is, without their having a voice by their delegates in the matter. Riots took place in many towns, and the stamped paper was seized and destroyed. A congress of nine states met and claimed the right of taxation for their own assemblies. The stamp-act was repealed by Parliament in February, 1766, after a great debate in which Burke made his first speech, and Pitt took the side of the colonists in one of his greatest speeches.

Stamp-Mill. A stamp-mill is a mill in which ore is pounded into particles so fine that the metal it contains is separated from the ore-stuff. Stamp-mills are commonly used for crushing gold or silver-bearing quartz. The stamps are stems of wrought iron two to three inches in diameter and ten to 15 feet long. At the bottom of the stem is a head eight to 12 inches in diameter and 15 to 20 inches long, into which is set a movable steel or cast-iron shoe, the diameter of which is the same as the head and the length somewhat less. When equipped, the stamp ordinarily weighs from 400 to 1,000 lbs. The ore is caught and crushed between the falling stamp and a die of the same material and diameter as the shoe. Ordinarily the ore is fed into a mortar-box containing five dies set on a level and in line. The box is enclosed, except for openings for the stems, the ore and water. Across the lower part of one side is stretched a screen of wire-mesh or perforated plate. The size of the openings in the screen is determined by the fineness of crushing required in order to separate the metal from



TEN-STAMP BATTERY

the ore-stuff. The five stamps that pound in the same battery are dropped in succession, and so the ore and water are driven from side to side. Particles crushed sufficiently small are washed through the screen.

Before the ore is fed into the mortar-box it must be broken into fragments from one to three inches in diameter. This is usually done by a machine called a rock-breaker, which rubs and presses the rocks between two hard, corrugated surfaces. In the modern stamp-mill the ore is dumped into great bins and then handled entirely by machinery.

The gold or silver that is free from chemical combination is caught on plates over which the stream of sand and water flows after leaving the battery. These plates are usually made of soft copper, which is rubbed with quicksilver until its surface forms an amalgam. This catches or amalgamates the gold or silver that comes in contact with it. The amalgam can then be scraped off and the gold or silver separated from the quicksilver. Sometimes gold is so fine that it floats on the surface of the water and does not touch the plate. Much of this floating gold can be caught on blankets over which the stream is made to flow. Still more important are the processes by which the chemical combinations containing gold or

silver, especially pyrites, are caught and saved. As pyrites is heavier than the ore-stuff, it can be separated by a process of shaking and settling. The machine by which this is done is called a concentrator or vanner, and most stamp-mills find it profitable to be well-equipped with these. Consult Huntington and McMillan's *Metals: their Properties and Treatment.*

Stamps are issued by governments for use on documents, merchandise, letters etc. Stamp-duties were first imposed in England in 1694. It is a form of indirect taxation, the stamps being bought of the government, the use of them required by law, and any forgery of them punished. During the Civil War in the United States many articles paid stamp-duty, the last of such taxes being repealed in 1883. In 1898 similar duties were imposed to help meet the cost of the Spanish-American war; but Congress in 1901 removed most of these taxes. Stamps for the payment of letters were first generally used in England in 1840, at the suggestion of Sir Rowland Hill, and in the United States in 1847. The first English postage-stamp was black, with a portrait of Queen Victoria, and since then about 1,600 different stamps have been in use in England and her colonies. The first United States stamp had the portrait of Franklin and was worth five cents. There have been a great variety used since, as many as 127 different kinds being in use at one time. Some countries have used the national arms on stamps, and some simply a number with an inscription. Stamp-collecting became fashionable about 1864 and has developed into a science called philately, with periodicals and associations devoted to the pursuit. Rare stamps command large prices, an English one of 1847 with the postal mark bringing about $375.

Stand'ard Oil Company, a company or group of companies originally organized by John D. Rockefeller, which has almost a monopoly of the oil-industry in many states of the American Union. It not only supplies the markets of the United States, but exports great quantities of oil abroad. Many charges have been urged against its business methods in ousting competitors, as also concerning its alleged political influence. In 1907 the company was convicted of accepting railroad rebates and fined $29,000,000, but this was set aside on appeal. In 1911 the United States Supreme Court sustained a decision made in 1909 by the Circuit Court of the United States declaring the company an illegal combination in restraint of trade and by the court's order, the parent company and its nineteen subsidaries were separated from each other and conducted under separate management.

Standards are weights and measures defined by proper authorities. National standards are defined and preserved by the respective governments of those who use them. There practically are only two groups of standards in use, the *British* and the *metric* group.

The British system is founded upon the standard yard, the standard pound and the standard gallon. The metric system is based upon the standard meter, the standard kilogram and the standard liter. See KILOGRAM, METRIC SYSTEM, POUND and YARD.

Besides these, the requirements of commerce and of modern science have made necessary standard thermometers, standards of electrical resistance, standards of light etc. Thus the mercury thermometer, which has been compared directly with the nitrogen gas thermometer at the international bureau of weights and measures at Sèvres, is practically a standard thermometer. The Hefner lamp, as tested by the Reichsanstalt at Charlottenburg, Prussia, practically is a standard for sources of light. But these standards, like the ohm, which is the standard of resistance, and the Clark cell, which is the standard of electromotive force, are defined in so definite a manner that they can be copied or made by any one who is equipped to follow the legal prescriptions; and hence they are represented by material or arbitrary standards, as in the case of the meter. See MEASUREMENT.

Stan'dish, Miles, one of the *Mayflower* company, was born in Lancashire, England, about 1584. He served in the army in the Netherlands and sailed with the Pilgrims in the *Mayflower* in 1620, though not a member of the Leyden congregation. On reaching Massachusetts he was chosen captain by the Pilgrims, and commanded in expeditions against the savages. He settled finally at Duxbury, Mass., where he died on Oct. 3, 1656. A monument, 100 feet high, crowned by a statue, has been built to his memory at Duxbury. The story of his unsuccessful effort to secure a wife is told by Longfellow in his *Courtship of Miles Standish,* which, however, is not free from anachronisms and inaccuracies. Consult *Life* by Abbot and *Footprints of Miles Standish* by De Costa.

Stan'ford, Leland, American public man and philanthropist, was born at Watervliet, N. Y., March 9, 1824, and died at Palo Alto, Cal., June 20, 1893. Early in life he studied law and was admitted to the New York bar; but in 1849, attracted by the gold-discoveries in California, he proceeded there and engaged in gold-mining and in business in San Francisco. He was one of the organizers of the Central Pacific Railroad Company, and entering political life was made Republican governor of California (1861–3). From 1885 to 1893 he was United States senator. Out of his

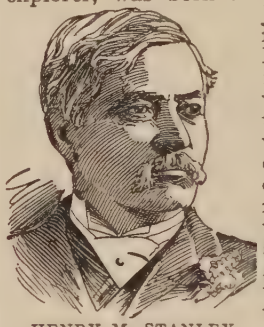
large money amassings he gave property to the value of $20,000,000 to found, in memory of a deceased son, a university at Palo Alto, to be known as the Leland Stanford Junior University — a princely and most useful benefaction. See PALO ALTO.

Stan'hope, Lady **Hester Lucy,** was born at London, England, March 12, 1776. For three years she lived with her uncle, William Pitt, as the manager of his household and his most trusted confidant, and at his death was given a pension by the king. In 1810 she began the life that made her famous, wandering on the eastern shores of the Mediterranean and settling in 1814 among the half-savage tribes of Mount Lebanon. She adopted the customs, costume and religion of the Mohammedans, and obtained great influence over the people, who looked upon her as a prophetess. The old convent where she lived was fortified and garrisoned by Albanians and became a refuge for all who needed help. She is said to have sheltered several hundred refugees after the siege of Acre. Her last years were spent in poverty, and she died near Mount Lebanon, with only natives around her, June 23, 1839. See *Memoirs,* published by Dr. Meryon.

Stanhope, Philip Henry, Earl, an English historian, was born at Kent, England, Jan. 31, 1805. He studied at Oxford and entered the house of commons, where he helped to secure the passing of the Copyright Act in 1842. His historical works, which rank very high, are *War of the Succession in Spain; History of England from the Peace of Utrecht to the Peace of Versailles;* and *History of Spain under Charles II.* He also wrote lives of Belisarius, Condé and Pitt, and edited *Chesterfield's Letters.* He is also known by his courtesy title of Lord Mahon. He died at Bournemouth, England, Dec. 22, 1875.

Stan'ley, Arthur Penrhyn, dean of Westminster, was born at Alderley, Cheshire, England, Dec. 13, 1815. He was educated at Rugby, under Dr. Arnold, and at Oxford. At Rugby he was mentioned as the delicate boy in *Tom Brown's Schooldays,* who, trembling with fear, still knelt to say his prayers in spite of the jeers and rough usage of his companions. At Oxford he took the Ireland scholarship, the Newdigate prize for a poem and a first-class degree; was made a Fellow of University College; and after traveling in the east became a tutor in the college. In 1851 he became canon of Canterbury; in 1856 professor of ecclesiastical history and canon of Christ Church; and in 1863 dean of Westminster. As a preacher at Westminster Abbey he had a wide influence, and a great multitude thronged the church whenever it was known that he was to preach. As a leader of the Broad-Church party, he invited clergymen of the Scottish church and of the Free-Churchmen of England to address his evening congregations. In 1852–3 he traveled in Egypt and Palestine, gaining material for his work on *Sinai and Palestine* (1856), and in Russia in 1857, embodying the results of the journey in his pictures of the life and history of Russia found in his *Eastern Church.* He was the author of *Thomas Arnold, Memorials of Canterbury, Memorials of Westminster Abbey* and of lectures and addresses. He died at Westminster, July 18, 1881, and was buried by his wife in Henry VII's Chapel. See *Life* by Oliver and Bradley's *Recollections.*

Stanley, Henry Morton, the African explorer, was born near Denbigh, Wales, Jan. 28, 1841. His name was John Rowlands, and at 14 he worked his way as a cabin-boy to New Orleans, where he obtained employment in the office of a merchant named Stanley, whose name he afterwards took. After the death of the merchant he entered the Confederate army, was taken prisoner, and later served in the United States navy. In 1867 he was a correspondent for the New York *Tribune* in an Indian expedition, and in the same year entered the service of the New York *Herald.* In 1867 he accompanied Lord Napier's expedition to Abyssinia as special correspondent for the *Herald,* and such were his enterprise and skill that the news of the fall of Magdala first reached the British government through the New York *Herald.* While in Spain, still acting as a newspaper-correspondent, he was called to Paris, where he received the order from the editor of the *Herald* to "find Livingstone." Traveling by way of Egypt, Palestine, Turkey, Persia and India, in January of 1871 he reached Zanzibar, and in March set out on his first journey into the heart of the dark continent. Two white men who started with him turned back, but Stanley pressed on with his band of natives, showing the courage and perseverance which have given him so high a place in the long roll of African explorers. He found Livingstone on Nov. 10 at Ujiji on Lake Tanganyika, and stayed with him four months, exploring the northern end of the lake and proving that it has no connection with the Nile. He reached England in August, 1872, where he was received with enthusiasm by the whole nation. *How I Found Livingstone,* published in the following November, had an enormous sale. As correspondent for the *Herald* he was in the Ashanti cam-



HENRY M. STANLEY

paign, reaching England in time to be present at the funeral of Livingstone in Westminster Abbey.

The death of Livingstone aroused a great desire in Stanley to complete his work. The New York *Herald* and the London *Daily Telegraph* fitted out an ex edition, giving him the command, and he left England in August, 1874, for his second African journey. With 350 men he started in November into the interior. He was ten months in crossing from the eastern to the western coast, arriving at the mouth of the Kongo a white-haired man, the only survivor of his white companions, and with scarcely a third of his native troops. *Through the Dark Continent*, the story of this journey, is more exciting than any romance. The direct results were the determining of the boundaries of Lakes Victoria and Tanganyika and the tracing of the Kongo from the heart of Africa to the Atlantic, thus changing materially the map of Africa. The opening of the Uganda region to missionaries, the forming of the Kongo Free State and the general scramble for Africa among European nations followed. Stanley acted from 1879 to 1884 under the king of Belgium in organizing the Kongo Free State, returning afterwards to the United States, where he delivered lectures on his African work. In 1889 he was sent in command of an expedition for the relief of Emin Pasha. He left the mouth of the Kongo on June 15, divided his forces at Yambuya, 1,300 miles from the sea, was for months hid from the civilized world, but, through disaster and loss of friends and followers, pressed on until he found Emin on the shores of Lake Albert. On this journey he discovered a great forest in the northern part of the Kongo basin and the huge snow-capped summit of Ruwenzori, 18,000 feet high. Other of his works are *In Darkest Africa, My Dark Companions, Slavery and the Slave-Trade; The Kongo and the Founding of its Free State; Coomassie and Magdala;* and *Through South Africa.* In 1899 he was knighted. He died on May 9, 1904. See *Life* by G. Mercer Adam.

Stan'ton, Edwin McMasters, an American statesman, was born at Steubenville, O., Dec. 19, 1814. He graduated at Kenyon College, and practiced law at Steubenville, at Pittsburg and finally at Washington. In 1860 he was made attorney-general of the United States, and in 1862 secretary of war. This important position he held during the Civil War, and many decisive movements of the army were made at his suggestion. Difficulties with President Johnson led to his resignation in 1868, Congress passing a vote of thanks for his ability and faithfulness. He was nominated judge of the supreme court by Grant, but died on Dec. 24, 1869, before his commission was made out.

Stanton, Eliz'abeth Ca'dy, an American reformer, was born at Johnstown, N. Y., in 1815. Her attention was first drawn to the wrongs of women in her father's law-office, where she heard their bitter complaints of the injustice of the laws. When fitted for college, having won the first prize in Greek, she could find no college that would admit a woman, and when attending the world's antislavery convention in London in 1840 with her husband who was a delegate, all the women-delegates were refused admission. One of these was Lucretia Mott, with whom she joined in the work of reform, the first woman's rights convention being held at her home in Seneca Falls, N. Y., July, 1848. From this time she continued to be one of the most prominent workers in the cause, addressing conventions, and political and legislative bodies. She died on Oct. 25, 1902.

Star-Cham'ber, a court which met in the council-chamber of the palace of Westminster. The roof of the room was decorated with gilt stars, which are supposed to have given the court its name It was founded or restored in 1487 by Henry VII to assist in bringing to justice the great landowners and nobles. It was independent of a jury, who were too often afraid of the nobility, and could inflict any punishment but death. The trial was conducted by written questions, unless the accused chose to confess. This confession became such an abuse, torture being used to extort it, that in 1641 the court was abolished.

Star of Bethlehem, a class of plants belonging to the lily family, somewhat like the hyacinth. It is a native of the eastern hemisphere. The common variety comes from France and Switzerland, and is found everywhere in gardens, with its clusters of white flowers and narrow, green leaves growing from bulbs.

Starch, a vegetable substance found in most plants, particularly in the seeds, bulbs, tubers etc. For commercial purposes starch is obtained from numerous plants, chief among which are wheat, corn, rice and potatoes. It has the same elements as sugar — carbon, hydrogen and oxygen — but in different proportions. It is made of small round grains or granules, which differ in shape in each species of plant. As usually prepared, it either is a white powder or irregular white columns, which come from the breaking up of a dried cake of the material. It does not dissolve perfectly in cold water, but with hot water the granules burst, forming a clear paste, which is the starch used in the laundry. When heated to about 320°, it is changed into dextrine, the gum used on postage-stamps. Starch is found especially in cereals, potatoes, carrots, parsnips, sago, tapioca and rice. Potatoes are about one-fifth starch; rye, oats, wheat and corn

nearly two thirds; and rice about nine tenths. Starch is made from corn by soaking it 48 hours in water, then grinding it and straining through sieves, after which the starch is allowed to settle in vats, when it is washed, bleached and dried. Potato-starch is made by grating potatoes, adding water and straining, settling, washing and drying. Wheat-starch and rice-starch are made by slightly different processes, to remove the gluten they contain. Arrow-root, tapioca, sago and cornstarch are forms of starch used as food. Starch is also used in the manufacture of calico and other cloths, in mounting photographs and in the laundry. It is also used in the manufacture of glucose, (*q. v.*). Cornstarch was first made in the United States in 1842. The factories at Oswego, N. Y., and Glen Cove on Long Island are the largest starch-factories in the world. There are about 100 starch-factories in the United States, making corn, wheat and potato starch, of which 10,000,000 pounds are exported yearly.

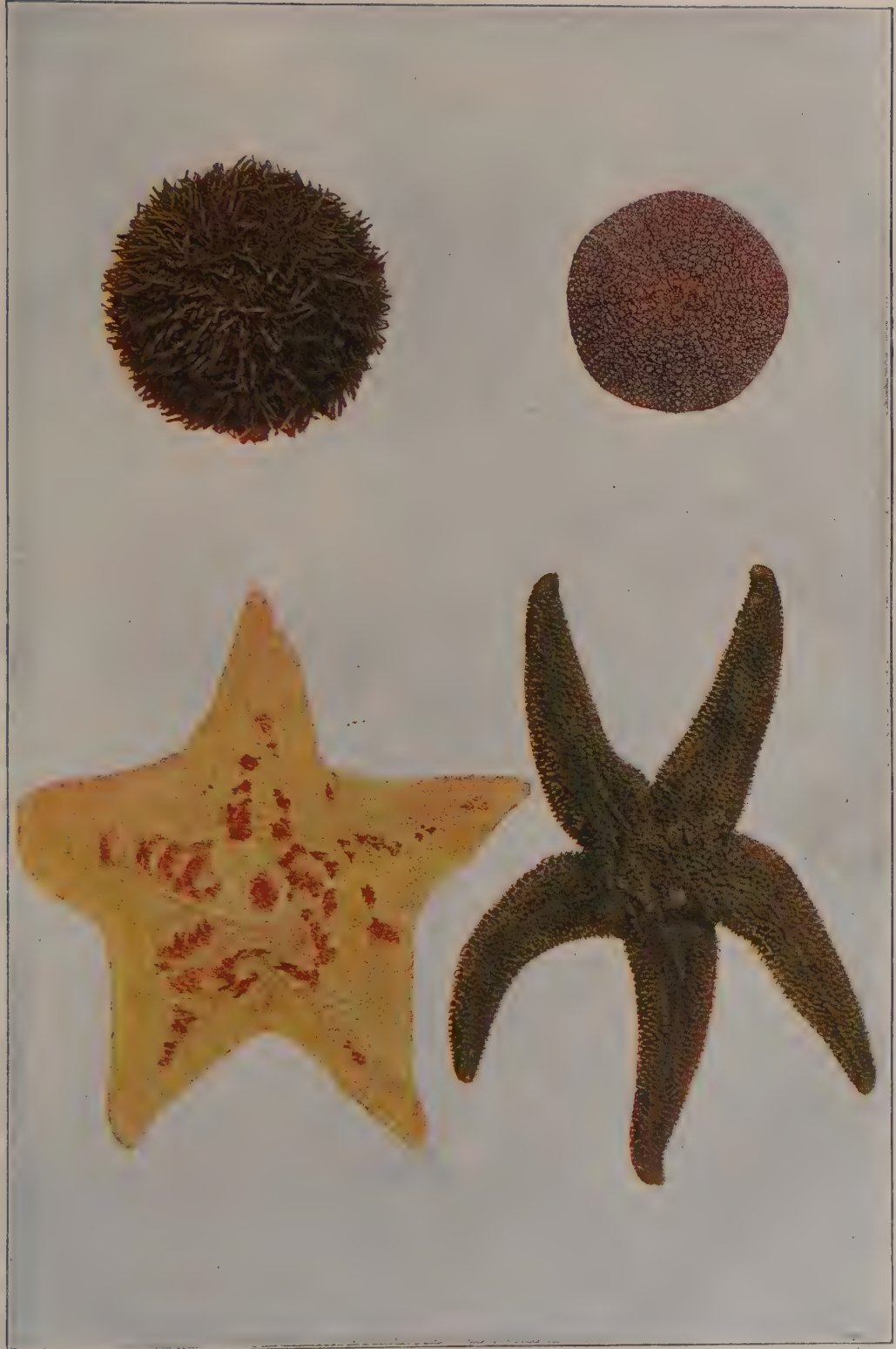
Star'fish, the name for a number of marine animals having arms or rays arranged around a central disk. As these

STARFISH

are symmetrically arranged, the animal is said to have radial symmetry. There are several varieties, but the common five-rayed starfish is the type. It is reddish, or yellow, in color, and those along the New England coast commonly vary from one inch to one foot in diameter. It lives on the sea bottom and crawls sluggishly by means of tube feet. It is often seen in shallow pools left by the retreating tide. The skin is stiffened with plates and nodules of lime. The mouth is in the center of the disk, on the under side, and the animals feed on decaying fish and other animal matter, as well as on small shelled mollusks. Their means of locomotion is peculiar. There are four rows of tube-feet in furrows along the lower sides of the arms. These tube-feet are filled with water and connected with a system of water tubes running through the body. On the back of every starfish may be seen a little rounded knob, which is porous and leads into the water-vascular system. From this tubercle, a tube leads downward to join a circular canal surrounding the mouth, and from this central canal a tube extends into each arm or ray. These latter canals are connected with the tube-feet and also with internal pockets, one for each tube-foot. The nervous system consists of a ring about the mouth and a nerve running from it into each arm. At the extremity of each arm is found a little red eye-spot which is sensitive to light. Some other starfish have 11 to 13 rays, and some resemble five-sided pin cushions in form. The brittle starfishes have a central disk, with long, slim, muscular rays by means of which they move. Their tube-feet are not developed. All starfishes possess the power of restoring, or regenerating, lost or injured parts. See ECHINODERMATA and SEA-URCHIN. Consult Romanes' *Jelly-fish, Star-fish and Sea-Urchin.*

Stark, John, an American soldier, was born at Londonderry, N. H., Aug. 28, 1728. He served in the French-and-Indian wars and at Ticonderoga in 1758. At Bunker Hill he was colonel of a regiment which he had enlisted; and was at the front in the attack on Trenton and in the battle of Princeton. He raised a new regiment in 1777, and was given command of the New Hampshire troops sent against the British troops from Canada. On Aug. 16, 1777, he fought the battle of Bennington (known in New York as Walloomsac), receiving for it the thanks of Congress and the rank of general. With a new force recruited by him in New Hampshire he cut off Burgoyne's retreat from Saratoga, and after serving in Rhode Island and New Jersey had charge in 1781 of the northern department, with headquarters at Saratoga. He died on May 8, 1822, the last but one of the generals of the Revolutionary army. See *New Hampshire Soldiers in the War* by Hammond and *Life of John Stark*, by Edward Everett, in Sparks' "American Biography."

Star'ling, a name for a number of common birds found only in the Eastern hemisphere, but lacking in Australia. This is the more remarkable as a starling is found in New Zealand, and others in various southern Pacific islands. The common starling of Europe is the best known. It is a beautiful bird with a dark plumage, having metallic green and purple reflections, and each feather tipped with buff. It nests near houses in bird boxes, when they are provided, and is easily tamed. It can be taught different notes and also



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SEA URCHINS AND STAR FISH.

to speak words; it is therefore often caged. They kill an immense number of insects and are beneficial to the gardener. A starling inhabiting the steppes and plains of Western Asia devours so many locusts that it is called the locust bird. The oxpecker of Africa is also a starling.

Stars, those heavenly bodies which appear as bright points having fixed positions in the sky. The spectroscope in the hands of Fraunhofer, Huggins and others has shown that these so-called fixed stars really are gigantic and very distant suns; for they give continuous spectra crossed by dark lines, indicating, as in the case of our central luminary, a solid or liquid core surrounded by incandescent vapor.

Ptolemy and Hipparchos divided the stars visible to the naked eye into six different groups, according to their brightness. These groups are called *magnitudes*, and since the invention of the telescope this classification has been so extended that astronomers grade stars into 14 or 15 groups. In the first magnitude they place the 14 brightest stars, including Sirius, Vega, Arcturus, etc.; in the second group are 48 stars, including the Pole Star and two Pointers; in the third 152; in the fourth 313; in the fifth 854; and in the sixth 2,010, making a total of 3,391, which are practically all the stars which can be seen without the aid of a glass. The number of stars which can be photographed, or which can be seen with our largest refracting telescopes, runs into the millions. The distances of the fixed stars are known only in a few cases, and even then very roughly. This quantity is determined by measuring the annual parallax of the star, a quantity which, except in a very few cases, is so minute as not to exceed the errors of measurement. The nearest star, so far as as known, is *a* Centauri, whose parallax is only ¾ of a second of arc, and even this, our nearest neighbor, is at the stupendous distance of four "light-years," *i. e.*, at a distance such that light would require four years to traverse it.

The student should bear in mind that, although these stars are said to be fixed, most of them exhibit, in fact, a small amount of motion, say, a second or so in a year. In addition to this motion across the heavens, which is measured in angle and is called *proper motion*, nearly all stars exhibit a motion toward us or away from us, which is called *motion in the line of sight*. The measurement of this latter motion is one of the recent achievements of the spectroscope, based on Döppler's principle. Consult Miss Clerke's *System of the Stars;* Chambers' *The Story of the Stars;* Lockyer's *Meteoric Hypothesis;* and Scheiner's *Astronomical Spectroscopy.* See NEBBULA, PARALLAX and TELESCOPE.

Star-Span'gled Banner, The. Words by Francis Scott Key, adapted to the old air *Anacreon in Heaven.* This air was the constitutional song of The Anacreontic Society of London, always sung by an official of the society at the supper with which it was customary to close the musical season, near the end of the 18th century. The tune was probably composed by Doctor Samuel Arnold (1740–1802). It became known in America in 1798, being sung at an anniversary meeting of the Massachusetts Charitable Fire-Society, to words by Thomas Paine, who later changed his name to Robert Treat Paine. Subsequently there were settings of other words to this tune, popularly known as *Adams and Liberty.* Further details regarding the tune and Key's words may be found in a pamphlet by Stephen Salisbury, Esq., of Worcester, Mass., and in *The National Music of America and its Sources* by Elson, Boston, 1899. See KEY, FRANCIS SCOTT.

Stat'en Island, the chief island in New York Harbor, forming Richmond County, N. Y., and the borough of Richmond in the enlarged city now known as Greater New York. It received its name from early Dutch settlers in honor of the states-general (Dutch *Staten*). It has an area of 58½ square miles, and is about 13 miles in length and eight in breadth. It is separated from Long Island by the Narrows and from New Jersey by the Kill von Kull and Staten Island Sound, and has steam-ferry communication with New York City and with New Jersey, while the Staten Island Rapid Transit Railroad reaches the towns, villages and watering places of importance on the island. Close to Clifton is Fort Wadsworth, and on the north shore is Sailor's Snug Harbor, an asylum for aged and infirm mariners. At Stapleton is a United States marine hospital, and between St. George and Tompkinsville is a United States light-house-station. On the island are the residences of many of the business men of New York City. Population 85,969.

States Gen'eral, The. In France the convocation of the representative body of the three orders of the French kingdom (representing the nobility, the clergy and the bourgeoisie) for deliberating on matters of public importance. It corresponded somewhat to our Congress. Under Charlemagne the national assembly was made up of nobles and clergy, a practice continued till about 900. Thereafter we have no trace of such an assembly in France till 1302 when Philip the Fair revived the states general, including representatives of the citizens because he hoped to gain their support in his struggle with Pope Boniface VIII. During the Hundred Years' War (1337–1453) it played an important rôle in connection with the revenues and taxation. It was not yet a law-making body. As kings gained power, backed by a standing army, they grew more inde-

pendent and the states general was not convoked from 1614 to 1789, when the refusal of the citizen members to count the vote by orders initiated the French Revolution. Thereafter the representative assembly of France took on various names, usually The National Assembly.

In Holland the name of states general is applied to the legislative body of the kingdom. It is composed of two houses, the upper elected by the provincial states and the lower chosen by the citizens.

States' Rights, a term used in the United States to indicate a doctrine, based upon an understanding of the constitution, which assumes that the different states of the Union are independent and that the citizens of a state owe allegiance only to the state; that the states are joined together only for certain purposes; and that the acts of the general government must be approved by the separate states, which possess the right also to nullify or pronounce them of no authority or, if necessary, to secede from the Union. The first appearance of this idea was in 1798, when the legislatures of Kentucky and Virginia protested on this ground against the alien and sedition laws which permitted the president of the United States to remove from the states aliens or foreigners whose presence might be considered dangerous and to punish sedition in the states. In 1811 and in 1819 the matter recurred in connection with the United States Bank charter, Henry Clay and Maryland claiming that the government had no authority to create a bank. In 1832 South Carolina attempted to carry the principle into action by pronouncing the high tariff "null and void" and not binding on its citizens. The passage of a compromise tariff-law settled the trouble for that time. In 1860-61 the southern states carried out the principle by seceding from the Union, and their action was followed by the Civil War.

State University of Iowa, located at Iowa City, was founded in 1847. It comprises a college of liberal arts, including civil and electrical engineering, colleges of law, medicine, dentistry, pharmacy and a school of pedagogy. It is open to students of both sexes, and has an attendance of 2,000, with a faculty of 165 and a library of 65,000 volumes. Its productive funds amount to $240,320; its income in 1907 was $324,048.

Statics (*stăt'ĭks*), a branch of mechanics. In pure mechanics (or dynamics, as it is frequently called), the effects of forces upon bodies are considered. If the effect of forces upon a body is to change the rate of motion of the body, the forces acting are said *not* to be in equilibrium. Forces and effects of this kind are studied under the head of kinetics. In all other cases forces are said to be in equilibrium and are studied under the head of statics. If one hold a steel-spring in his hands and bend it, he recognizes that there are forces acting upon the spring by the fact that the shape of the spring is temporarily changed. These forces do not produce any motion in the spring; they are in equilibrium. It is this group of forces which is considered under the head of statics. For another illustration allow a locomotive to stand at rest on a steel bridge. The bridge sags slightly as the locomotive takes up its position. But the upward force with which the bridge tends to regain its original shape is exactly equal and opposite to the weight of the locomotive. These stresses produced by the locomotive and the strains which result from them illustrate the kind of problems studied under the title of statics.

Statics may, therefore, be defined as the science of the equilibrium of forces. It is very important in this connection for the student to distinguish carefully between a body which is at rest and one which is in equilibrium. A pendulum bob at the end of its swing is in rest; but it is not in equilibrium, for at that very instant it is being set in motion by its weight. The two general conditions of equilibrium for any body are that the sum of all the forces acting upon the body shall be zero and that the sum of all the moments of force acting upon the body shall be zero.

The application of these general principles to the cases of simple machines, as the lever, inclined plane etc., is the portion of statics ordinarily studied in physics; while the application of these principles to various structures, as bridges, roofs etc., is the part of statics which is pursued by engineers. The conditions under which fluids remain in equilibrium form the science of hydrostatics.

Stevinns (1548–1603) showed that a force can be completely represented by a straight line. Upon this simple fact a branch of mathematics called graphical statics has been recently founded, and has furnished many elegant geometrical solutions of engineering problems. For an unusually interesting history of statics see Mach's *Science of Mechanics.* Minchin's *Treatise on Statics* (Clarendon Press) contains an extraordinarily clear presentation of the entire subject.

Staunton (*stan'tŭn*), **Va.,** a city, the seat of Augusta County, on the Chesapeake and Ohio and Baltimore and Ohio railways, over 110 miles northwest of Richmond. It has waterworks and an electric-light plant, both of which the city operates, substantial public buildings, the city-hall, court-house, churches and schools, a Masonic Temple and a military academy etc. It is the seat of the Western State Hospital for the Insane, the Virginia School for the Deaf and the Blind, Virginia Female Insti-

tute and Cary Baldwin Seminary. The city manufactures (besides agricultural implements and machine-shop products) organs, overalls and wagons; it also has a flour-mill and a planing-mill. Population 10,604.

Stead, William Thomas, an English journalist, was born on July 5, 1849, at Embleton, Northumberland. At 14 he became merchant's apprentice and at 22 editor of *The Northern Echo*, Darlington. In 1880 he became associate-editor of the *Pall Mall Gazette* and in 1883 the editor. In 1890 he founded *The Review of Reviews*, one year later *The American Review of Reviews* and in 1893 *The Australian Review of Reviews*. In 1895 he began the publication of the *Masterpiece Library of Penny Poets, Novels and Prose Classics*. His interests have been social and broadly democratic. For one of his publications against existing social evils, *The Maiden Tribute of Modern Babylon*, he was put in jail for three months. His efforts in the interest of international peace have been untiring. His more important publications are *The Truth About the Navy*, *Truth about Russia*, *The Pope and the New See*, *The Story that Transformed the World*, *If Christ came to Chicago*, *The Labor War in the United States*, *Satan's Invisible World*, *A Study of Despairing Democracy*, *The United States of Europe*, *Mr. Carnegie's Conundrum*, *The Conference at the Hague*, *The Americanization of the World*, *The Last Will and Testament of Cecil John Rhodes*. He died in the wreck of the *Titanic*, April 14, 1912.

Steal Away, American Negro Song, published in *Jubilee Singers of Fisk University* by G. D. Pike. S. Coleridge Taylor has also made a transcription of the melody in his *Twenty-four Negro Melodies, transcribed for the Piano*.

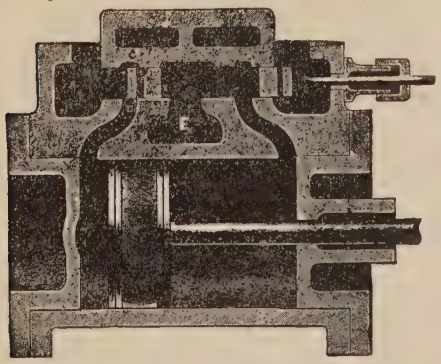
Steam is the vapor of water. Water gives off vapor without being heated, but this process is usually called evaporation, and the word "steam" is limited to the vapor which arises from boiling water. Steam is lighter than air, and occupies much more space than water; a cubic inch of water will make nearly a cubic foot of steam. Water boils at 212° F. and makes steam, which has the same temperature as the water, but really contains more heat, so that the steam from a boiling teakettle will burn more severely than the boiling water. This extra heat is called latent heat, because it does not affect the thermometer. The boiling temperature of 212° F. is practically constant in vessels which have a free outlet for the steam; but in closed vessels, like boilers, the boiling-point may be raised, and much pressure is produced at the same time. The pressure increases faster than the temperature; for instance, the pressure at the boiling-point is one atmosphere, but it becomes two atmospheres at 249°, four at 301° and twenty at 444°. When the engineer opens a valve to let off steam, the rushing noise it makes shows its power. Steam is used to produce motion, as in the locomotive and other machines; in heating houses; and in other operations where heat is required.

Steamboat. See STEAMSHIP.

Steam-En'gine, an apparatus for doing mechanical work by means of heat applied to water. The steam-engine is a form of heat-engine, of which the gas-engine and hot-air engine are two other commercial forms. The first steam-engine dates back to the second century before Christ in the toy æolipile of Hero and in conjuring apparatus used by priests. The beginning of the modern steam-engine was in the water-raising engine of Thomas Savery in 1698. In this the steam acted directly on the water to be raised. The first use of the piston was by Papin in 1705 in a modification of Savery's engine. In the same year Thomas Newcomen made a piston-engine which more nearly approached our modern form. It was, as its name implied, an atmospheric engine. The piston working in a cylinder was connected by a chain with one end of an overhead beam. Steam admitted from the boiler to the cylinder allowed the piston to be raised by a heavy counterpoise hung from the other end of the beam. Then the valve was shut and the steam in the cylinder condensed by a jet of cold water. This left a vacuum in the cylinder and the piston was forced down by the pressure of the atmosphere, and work was done by lifting a pump-rod which was fastened to the other end of the beam. The common story is that a lazy but ingenious boy named Humphrey Potter, who had been set to turn the valve, made the engine close and open its own valves by means of cords and thus invented the first automatic valve-gear. Newcomen's engines were used solely for pumping water from the English collieries. The modern steam-engine is due to James Watt (*q.v.*), an instrument-maker for the University of Glasgow. Watt's great advances were (1) condensing the steam in a separate vessel called the condenser, thus keeping the cylinder hot, (2) adding an air-pump to help to maintain the vacuum of the cylinder and remove the condensed steam, (3) jacketing the cylinder to prevent cooling off by conduction and radiation, (4) making the engine double-acting, that is, forcing the piston back not by the atmosphere but by steam admitted at the other end of the cylinder and (5) using the steam expansively, in other words, stopping the

PISTON AND CYLINDER

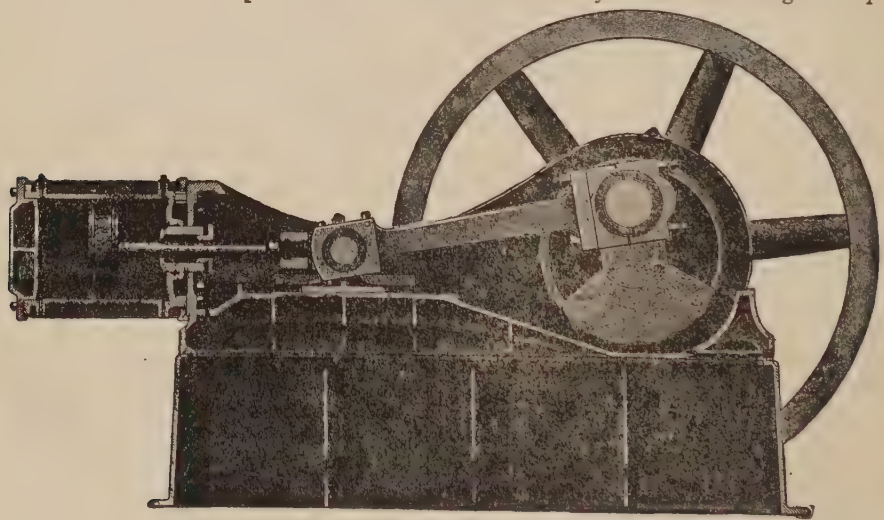
admission of steam when the piston had made only a part of its stroke, and allowing the rest of the stroke to be performed by the expansion of the steam already in the cylinder. He also made many inven-



PISTON-CYLINDER AND SLIDE-VALVE

tions of important details, as the throttle-valve for regulating the admission of steam, the centrifugal governor (see GOVERNOR), the indicator for studying the actions in the cylinder (see INDICATOR), and, in conjunction with Murdoch, the slide-valve for controlling the admission and release of steam. He also patented the use of two or more successive cylinders on one engine, or the modern compound-engine plan, which is used in all large engines where economy of fuel is important. Watt's inventive career extended over more than a half century, and he is rightly called the father of the modern steam-engine. For the full history of the steam-engine, see Thurston's *Growth of the Steam-Engine.*

The action of a simple steam-engine with the slide-valve, one of the simplest forms, can be easily studied from the diagram. This is a horizontal section of a cylinder, showing the piston in the cylinder and the valve below. As shown, the piston has reached the extreme left of the cylinder, and the port B on the right is connected with the exhaust E. This exhaust connects with the atmosphere in noncondensing engines, or with the cold condenser in condensing engines. Live steam is at the same time entering the left end of the cylinder at B from the steam-chest A, thus moving the piston back to the right. The time of the admission and cut-off of the steam and the connection with the exhaust is fixed by the mechanism which moves the valve. The number of valve-mechanisms in use is very great, but they all serve the general purpose seen above. Among the best known valve-mechanisms is that due to George H. Corliss. In the Corliss valve-mechanism there are two separate ports at each end of the cylinder, one for the steam-chest and one for the exhaust. This or a modified form is often used on large engines. To convert the straight-line backward-and-forward motion of the piston into rotary motion, a connecting rod and crank on a fly-wheel are used. The efficiency of a steam-engine depends largely upon allowing the steam to expand so far as possible, so that its temperature and pressure are as low as possible when it leaves the cylinder. Steam is consequently not used at full pressure through the whole stroke, but connection with the steam-chest is cut off at a proper fraction of the stroke and the piston is then moved by the expansion of the steam. Steam-

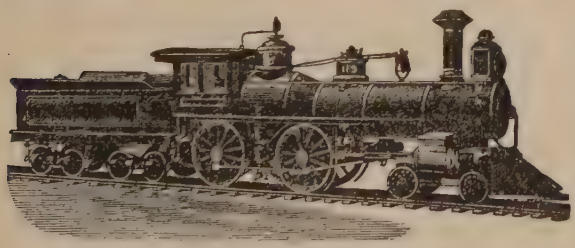


SECTION OF STEAM-ENGINE

engines are rated in horse-power, one horse-power representing the work of 33,000 foot-pounds per minute. (See DYNAMOMETER.) The performance of a steam-engine is indicated by the pounds of steam or water it consumes per horse-power per hour. For noncondensing engines 35 lbs. of steam at 100 lbs. pressure is a common performance. The best large condensing engines give records of from 17 to 20 lbs. of steam at 100 lbs. pressure for one horse-power for one hour. The following are terms used to designate different forms of engines. Horizontal, inclined and vertical refer to the position of the cylinder. High and low, as applied to speed, are relative terms. A speed of 150 revolutions per minute is a medium speed. Much above or below this is called high or low. Noncondensing and condensing are terms referring to the exhaust. In a noncondensing engine the exhaust is directly into the air; in a condensing engine the exhaust steam is condensed usually by contact with cool running water. Simple and compound are terms referring to the number of expansions used in the engine. In a simple engine there are a single cylinder and a single expansion; in the compound engine there are at least two cylinders and two expansions. Compound engines are more economical. Rotary engine is a form of engine in which the piston rotates. In the common steam-engine the piston moves backward and forward. A rotary engine has the very decided mechanical advantage of compactness and of direct application of power without crank and fly-wheel, but no rotary engine of the many that have been invented has ever shown itself economical or durable, except the steam-turbine. (See TURBINE.)

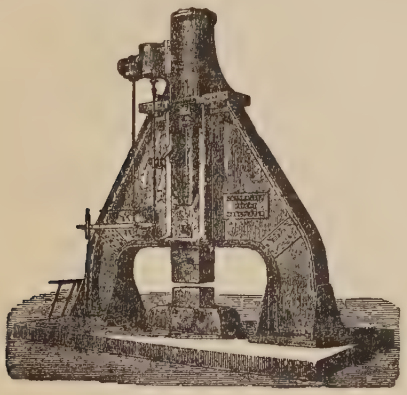
A LOCOMOTIVE is a steam-engine so arranged with wheels as to drive itself on an iron or steel track. As a steam-engine the locomotive has a number of special features. It carries its furnace and boiler with it, and must also be supplied with an auxiliary car or tender for carrying water and fuel. The engine is double, that is, there is a high-pressure cylinder with piston on each side of the locomotive. Many modern locomotives are also compound steam-engines, that is, the steam-expansion takes place in two cylinders, a high-pressure and a low-pressure cylinder. The steam-pressures commonly used are from 150 to 200 pounds per square inch. The oscillating, straight-line motion of the piston is converted into the rotary motion of the driving wheels by the usual mechanism of a cross-head and crank. The engine must be reversible. This is accomplished by a link-motion due to Stephenson, by which the connection of the valve-mechanism with the driving parts can be shifted through an angle. A requirement of the locomotive is the development of a large power in a limited space and with a limited weight. This means the burning of a large amount of fuel per square foot of grate-area, and requires forced draft. It is accomplished by exhausting steam directly into the smoke-stack. The American and European locomotives differ little as steam-engines, but present quite different external appearances. The large cab for the engineer, the pilot or cow-catcher, the headlight, the prominent whistle and bell are striking external features of the American locomotive. The frame of the engine and boiler is also quite different, that of the European locomotives being more rigid than can be used on American railroad-tracks. The first successful locomotive is due to George Stephenson (*q. v.*), and was used to haul coal for the Killingworth colliery in 1815. At the opening of the Stockton and Darlington railroad, an English line of 37 miles opened in 1825, a Stephenson engine, weighing eight tons and capable of 16 miles per hour, was used. Of the early locomotives R. Stephenson's *Rocket* was one of the most famous. At a competitive trial of locomotives in 1829 this engine showed a speed of from 25 to 30 miles per hour. These early locomotives are pygmies compared with the heavy, high-speed machines of to-day. Speeds of 100 miles per hour have been frequently exceeded in the last few years by express-locomotives. The largest locomotive in the world is one in use on the Illinois Central Railroad for hauling freight-trains over some steep grades on its line. It was built by the Brooke Locomotive Works, and weighs, without tender, over 230,000 pounds. The largest locomotive works in the world are the Baldwin Works at Philadelphia, Pa.

A. P. CARMAN.



Steam-Ham'mer, a hammer which is raised by the direct action of steam on a piston in a steam-cylinder. It is used in forging iron, particularly for large and heavy work. The first idea of the steam-hammer is due to James Watt, but the first practical scheme of a steam-hammer is due to James Nasmyth (*q. v.*). His first machine was made in 1843. The piston moved by steam raises the hammer-head or "tup," until the steam is cut off and allowed to

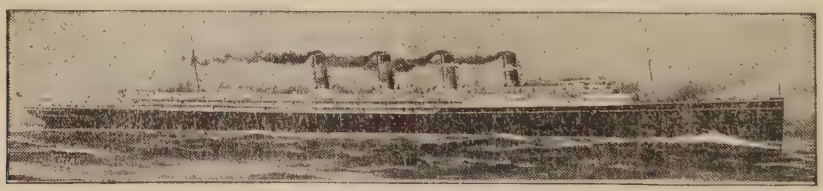
escape, when the piston with the tup falls, striking the object placed on the hammer. The blows may be so regulated as just to crack an egg or to strike with a force of tons. In modern steam-hammers the force of the blow is increased by the pressure of the steam above the piston, and by automatic valve-mechanisms the blows can be repeated with great rapidity. The largest



STEAM-HAMMER

steam-hammer ever built is that built for the Bethlehem Iron-Works in 1891. The piston with tup weighs 125 tons, the cylinder has a diameter of 76 inches, and the length of the stroke is 16½ feet. Such large hammers are no longer used, as the work is done better and cheaper by large hydraulic presses. The Bethlehem steam-hammer has been superseded by a 14,000-ton hydraulic press.

Steam'ship, a vessel moved by steam. A half-successful experiment was made by Papin to use steam to propel a boat as early as 1707, but it was not until the perfecting of the steam-engine by Watt that any advance was made in steam-navigation. Early inventors of steamboats were William Henry, 1783, and John Fitch, 1785–96, in the United States and William Symmington and Henry Bell in Great Britain, but the first steam-vessel to make a voyage of any considerable length was the *Clermont*, made by Robert Fulton in 1807. She was 133 feet long, and made the voyage of 150 miles from New York to Albany in 32 hours. In the same year Col. John Stevens built at New York the *Phœnix*, which was taken around to Delaware River by sea because Fulton had a monopoly of steam-navigation on the Hudson. This was the first steamboat to make a sea-voyage. The first passenger steamboat in operation in Europe was the *Comet* on the Clyde in 1812, although a successful boat had been on the Clyde Canal as early as 1802. The first steamship to cross the ocean was the *Savannah*, a ship of 350 tons, which made the voyage from Savannah, Ga., to Liverpool and thence to St. Petersburg in 1819. Both sails and steam were used. The voyage to Liverpool was made in 25 days. The first vessels to cross the Atlantic using steam the whole distance were the *Great Western* and the *Sirius*, which reached New York on the same day, April 23, 1838. Since then the transatlantic steamship-service from New York has been continuous. All the earlier steamships were propelled by wheels at the side or at the ends. The screw-propeller was introduced by Smith and Ericsson about 1840 (see SCREW-PROPELLER), and since then all ocean-steamers and many inland steamers use it. Iron and steel have superseded wood for large ships, and steamships have continued to grow in size, power of engines and speed. The voyage from New York to England is now made in four days and fifteen hours by the fastest ship or in seven days by the slow steamers. The largest and fastest steamers on the ocean to-day are the *Deutschland*, length 686 feet, displacement 23,000 tons, average speed 23.36 knots per hour, H. P. of engines 35,000; *Oceanic*, length 704 feet, displacement 28,000 tons, average speed 20.48 knots per hour, H. P. of engines 28,000 *Lusitania*, 790 feet long, 32,000 tons' displacement and average speed 25,05 knots an hour; and *Mauretania*, 790 feet long, 32,000 tons' displacement and average speed 24.86 knots an hour. Each of the last two steamers has 70,000 horse-power. The White Star Line is building two Atlantic liners of 42,000 tons' burden each and over 900 feet in length. The *Mauretania* and *Lusitania* are quadruple-screw turbines and are not merely floating hotels or palaces but cities at sea. The average daily coal-consumption of the



STEAMSHIP LUSITANIA

Deutschland is 570 tons. In the United States, steamship-building has until recent years been largely confined to vessels for inland waters. The river steamboats of the United States are fine examples of boat-building. They must ascend rivers against strong currents, and often need to travel in shallow waters and carry large amounts of freight or tow large fleets of barges. This has developed a large vessel of only a few feet draught and with very powerful engines. On the western rivers most of the boats have stern-wheels. The steamers on the Great Lakes rival ocean-steamers in speed, size and equipment. Most of them are engaged in the transportation of grain and of iron-ore. Since 1883 ocean-steamship building in the United States has developed largely, owing to the impetus given by the construction of the large government cruisers and warships of "the new navy." The largest and finest commercial steamships built in the United States are the *Minnesota* and her sister-ship, built at New London, Conn., for the Pacific trade, the former being 630 feet long and having, when built, the greatest depth of any ship on the ocean. See NAVY, SHIP, SHIPBUILDING and TURBINE.

Steam-Shov'el and Dredge, a machine, worked with crane and steam-power attached, mounted on wheels for running on rails, and used for excavating clay, sand, gravel or other soil in railroad or other cuttings; also used for river-dredging, the deepening of canals etc. by a suction-process. The steam-shovel in use for heavy work has a boom, usually made of strong steel-girders, with a powerful thrusting-engine for giving ample scooping-force to the shovel, the latter generally being provided with heavy, pointed teeth for excavating loose rock. The bottom of the shovel or bucket is hinged, so that, when filled and raised, its contents are released by pulling a latch-cord and dumping the load into cart, car or other vehicle for removal. The thrusting of the shovel, as well as the hoisting and dumping, is the work of the attached engine, working along the movable crane. With a 2¼ or 3 cubic-yards' shovel about 2,400 cubic yards of sand and 600 of loose rock can be excavated in ten hours. For dredging river-bottoms and delivering the mud or other material on shore, machines with belt-conveyors are used, different in pattern and varying in capacity and rapidity in work. Some varieties deliver to the shore or to a scow alongside by gravity, by means of an extensible sheet-iron trough or sipper-shovel of large dimensions.

Steam-Turbine. See TURBINE.

Steam-Whis'tle, a mechanism attached to the steam-boiler in a railway-locomotive, marine engine etc., through which the escaping steam, issuing from a narrow annular orifice in a hemispherical cup, strikes the thin edge of a bell on top and produces a loud, more or less prolonged whistle, which serves as signal or warning.

Sted'man, Edmund Clarence, an American poet was born at Hartford, Conn., Oct. 8, 1833. He studied at Yale, and began his literary career as a journalist, acting as correspondent for *The New York World* during the Civil War. He also contributed to magazines. His first volume of poetry, published in 1860, was rapidly succeeded by others. *Victorian Poets*, which has gone through several editions, appeared in 1875, and *Poets of America* in 1885. With Ellen M. Hutchinson he edited *The Library of American Literature*, and he also brought out a Household Edition of his poems. Other works edited by him include *A Victorian Anthology*, *An American Anthology*, *Poe's Works*, *Landor's Poems* and *Aldrich's Poems*. He died on Jan. 18, 1908.

Steel is iron carbonized. It is of several sorts, each possessing special properties and being made by a particular process; is extremely elastic; and has greater tensile strength than any other metal. No law of connection between its composition and its properties has been discovered, and carbon's form in steel remains undetermined. The term formerly designated a carbonized iron that would harden when heated to a certain temperature and then suddenly cooled; but only carbonized iron produced by modern methods is now considered steel. Iron is used in the industrial arts as cast-iron, wrought iron and steel, and each has marked physical properties that fit each for special purposes.

Cast iron is produced by heating iron-ores to a high temperature in a blast-furnace in connection with various fluxes, particularly limestone. The molten metal contains considerable carbon dissolved and, usually, silicon, phosphorus and sulphur. The amount of carbon in cast iron varies from 1.5% to 4.5%. Cast iron can be melted and cast in molds. It is only slightly malleable, except when specially treated, is rigid and has great resistance to crushing, but is more or less brittle and not adapted to tensile strains. Wrought iron is nearly pure iron, and in modern metallurgical processes is usually obtained by removing the carbon and other impurities from cast iron. The common method of making wrought iron is that of puddling. This consists of melting cast iron in the chamber of a flame-furnace (see FURNACE) and in removing the carbon, phosphorus etc. by stirring the molten metal and, sometimes, by adding oxidizing materials. Wrought iron is very malleable, can be welded, has a high tensile strength and shows a fibrous rather than a crystalline structure at a break. Steel has been made since very early times by a

process called cementation. This consists of taking a high grade of wrought iron rolled into bars, putting these in fireclay boxes with finely divided charcoal and heating them from three to six days. This recarbonizes the iron, and produces cement or blister-steel. Bars of blister-steel may be welded together (then called shear-steel), or they may be melted in crucibles and cast, and are then called crucible-steel. High-grade tool and spring steel is made by this process, while the cheaper open-hearth and pneumatic processes are used in the manufacture of the great quantities of steel used in engineering construction-work.

The pneumatic process, universally called the Bessemer process, was invented by William Kelly (*q. v.*) of Pittsburgh in 1847, and ranks among the most important of industrial achievments The discovery was an entirely new idea, revolutionized steel-making, and supplied the most useful and precious of metals cheaply as well as abundantly. Without such steel modern railways and steamships and much machinery would be impossible. Years before Bessemer of England experimented in iron, steamers on the Ohio had boilers of iron refined by Kelly's process. This consists of burning pigiron's impurities away by blowing fine aircurrents (whence the term pneumatic) through the melted metal and pouring back the needed amount of carbon. Bessemer discovered the process in 1855, and invented machinery that made it a commercial success. Mushet perfected the process chemically. The operation is performed in a pear-shaped pot, the converter, commonly 15 feet high by eight across, which since 1858 has but slightly changed its form. It is made of boiler-plate and lined with refractory material. When the iron turns white, it has become steel, and is poured out and worked. Bessemer steel lacks sufficient hardness for every purpose. Steel for hammers, knives, springs and a thousand finer articles, must be made by slower and more careful methods. Hence it is manufactured on the open hearths of flame or reverbatory furnaces by melting cast-iron, scrap-iron and wrought-iron together. In reliability and uniformness openhearth steel surpasses bessemer, but bessemer is the steel for engineers and builders.

Within 15 years steel has largely superseded brick, stone and wood in bridges and great buildings, ships being built of steel almost exclusively. Pittsburgh began about 1885 to produce beams, girders and other structural shapes; in 1892 production by automatic machinery displaced production by men; and American cities have since been rebuilt in steel. Barrels, bathtubs and furniture are now made of steel, as are cars, cotton-bands, roadways, sleepers and ties. Corrugated sheet-steel replaces wooden siding in buildings; expanded steel, a mesh of ribboney laths; ornamental steel-ceilings, plaster. Steel-frame churches have been erected, and New York's subway is a steel-tube.

No industry equals that of iron and steel in numbers, organization and wealth. America in its 5,370 establishments, produces nearly half the steel of the world. Pittsburgh makes more iron and steel than Great Britain, Chicago ranking second and making a third of our rails. The total value of the industry, whose movement is toward the lakes, is two billion dollars.

Though steelmaking has been revolutionized, vaster changes impend. The rolling-mill will become even more automatic. The important problems are the improvement of the quality of steel and the protection of workmen. The Bessemer converter is being replaced by the open hearth. A process has been invented, the duplex, that combines the pneumatic and openhearth methods. Less and less coal is needed in ironmaking, while oil, gas and electricity supply additional fuels or new processes and means. Highclass steel said to equal crucible-steel has been made directly from iron *ore* by an electric process. Finally, since dry air produces a hotter fire, with less fuel, than damp air, a process has been invented that takes the moisture, no small item, from air blown into the furnace, and the process increases production nearly a fifth.

Steel-Build'ing-Construc'tion, a method of constructing tall city-buildings by building a framework of steel to carry floors and floor-loads, and walling this framework in with a wall of light brick or stone work. These buildings differ from the older buildings in that the masonry walls do not carry the loads of the building. They really are an application of the method of the steel-bridge to architecture. The office-buildings of Chicago, New York and other American cities are the best examples of this new architectural method. Among the tallest of these buildings are the Metropolitan Life-Insurance Building, New York City, 46 stories or 657 feet in height; the Singer Building, 41 stories or 612 ft. 1 in. high; and *The Times Building*, 28 stories or 419 ft. 9 in. high.

Steele, Sir **Richard,** a British author, was born at Dublin, Ireland, in March, 1672. He studied at Oxford, but in 1694 suddenly enlisted in a troop of horse-guards. His pamphlet known as *The Christian Hero* was published in 1701, followed by very different work in the shape of three plays, *Grief à la Mode*, *The Lying Lover* and *The Tender Husband*. In 1706 he received a court appointment under Queen Anne and the post of gazetteer, with a salary of $1,500, which, with two wealthy marriages, one in 1705 and the other in 1707, gave him ample means. Dissipation, however, kept him in

pecuniary trouble most of the time, his life being spent, as he says, "in sinning and repenting." On April 12, 1709, appeared the first number of the famous *Tatler*, a tri-weekly paper, which was followed in March, 1710, by the more famous *Spectator*, in turn succeeded in March, 1713, by the *Guardian*. Addison (*q. v.*) a friend and schoolmate of Steele, was his valued and valuable assistant in all these enterprises; as he said: "I fared like a distressed prince who calls in a powerful neighbor to his aid; I was undone by my auxiliary; when I had once called him in, I could not subsist without dependence on him." The characters of Sir Roger de Coverley and Will Honeycomb are said to have been first suggested by Steele, and his fame rests mainly on the essays contributed to these papers. His political career in Parliament ended in impeachment and expulsion for what were considered treasonable writings in *The Crisis*, a pamphlet published by him in 1717 and answered by Swift. He again entered Parliament after the death of Queen Anne, was knighted by George I, and in 1722 published his best comedy, *The Conscious Lovers*. He died on Sept. 1, 1729. See *Memoir* by Austin Dobson, in the English Worthies Series; and *Life* by Aitken.

Steel'ton, Pa., a borough of Dauphin County, on Susquehanna River and the Pennsylvania Canal, three miles southeast of Harrisburg, with which it is connected by electric railway. Here is the large plant of the Pennsylvania Steel Company, engaged in the manufacture of Bessemer steel, for rail, bridge and construction works. It has, besides, saw, planing and flour mills. It is served by the Pennsylvania and Reading railroads. It has a number of churches, schools, banks, and other public buildings. Population 14,246.

Stein (*stīn*), **Heinrich Friedrich Karl, Baron von,** a Prussian statesman, was born at Nassau, Germany, Oct. 26, 1757. He entered the service of Prussia in 1780, and in four years was head of the mines in Westphalia. He was called in 1804 to be head of the department that controlled customs, taxes and trade, but being unable to work with the king he resigned in 1807, while in retirement writing an essay on political reform. Before the year was ended, however, Frederick William III had to recall him, and in less than a year Stein carried out the measures he had planned, which laid the foundation of Prussia's greatness. He abolished the remains of serfdom, did away with privileged classes and all monopolies, and supported the army reforms But Napoleon, who had advised his recall, now fearing him, insisted upon his dismissal, and in 1808 he withdrew to Austria and finally to Russia, after having issued his *Political Testament*. He was influential in forming the union against Napoleon. After his return to Prussia he established a society for publishing the historical documents of Germany. He died in Westphalia, June 29, 1831. See *Life and Times of Stein* by Seeley.

Stele (*stēl*) (in plants). The mature stems and roots of higher plants have three great regions. The outermost is the epidermis; next within is the cortex; while the central or axial region is the stele. The stele is derived from the plerome (which see), and is characterized by developing the vascular bundles. To it also belongs the pith of dicotyledonous stems. In the trunk of an ordinary tree the epidermis has disappeared; the cortex is mostly represented by the corky part of the bark; while the whole mass of wood and the inner fibrous bark belong to the stele.

Stelvio (*stĕl'vē-ō*), **Pass of,** is the highest carriage-road across the Alps, remarkable for its beautiful scenery. It is 9,042 feet above the sea, 33 miles long, and forms part of the great road between Milan and Innsbruck.

Stem. In general, the axis part of a differentiated shoot, and in this sense it includes the shoot axis of mosses and leafy liverworts. Its special application, however, is among fern-plants and seed-plants, in which group the vascular system is developed. In structure there are several distinct types of stems, but they are all developed in the same general way. At the growing tip of the stem there is a single cell (most *Pteridophytes*) or a group of cells (some *Pteridophytes* and all *Spermatophytes*) known as the apical cell or cells. These apical cells are meristematic, and by their division organize the two or three great regions of the stem. In the stem of an ordinary seed-plant the three embryonic regions, beginning at the outside, are the dermatogen, periblem and plerome (see all three). The dermatogen gives to the epidermis, the periblem to the cortex, and the plerome to the stele. The chief differences

Vertical section of stem tip, showing growing point (*s*), forming leaves (*b*), cortex (*r*), and central cylinder (*m*), in which the woody bundles are to appear.

among stems consist in the various organizations of the vascular or woody tissues in the stele. For example, in the *Gymnosperms* and *Dicotyledons* the woody bundles are organized into a hollow cylinder, within which is a definite pith; while in the *Monocotyledons* the woody bundles are scattered in the stele. The usual function of stems is to display foliage leaves; but sometimes they become much modified, especially when subterranean. In this case they are usually used for the storage of reserve food, and become variously thickened and distorted, being called tubers, rootstocks (rhizomes) etc.

Stephen (*stē'ven*), the first Christian martyr, was one of the first seven deacons chosen by the church at Jerusalem at the instance of the Apostles. (*Acts vi.*) He was a popular preacher who grasped the meaning of the great revolution which Christianity had brought into the Mosaic institutions. He was accused of blasphemy, and, before he could finish a speech in his own defense, was hurried outside the city-walls and stoned to death, while praying for his accusers. (*Acts vii:* 60.) He is celebrated in the Roman and Anglican churches on December 26th, in the Greek church on the 27th.

Stephen, king of England, was born at Blois in 1105. He was the grandson of William the Conqueror and nephew of Henry I of England. On the death of Henry Stephen claimed the throne, though he had taken the oath of allegiance to his cousin Matilda, on whom Henry I had settled the succession. He was crowned on Dec 26, 1135, but never received the confidence of his people. The kingdom was badly governed, the nobles and clergy were against him, and he had to struggle with Matilda for the throne. In 1141 Stephen was taken prisoner and Matilda cknowledged queen. He was exchanged for Robert of Gloucester, the queen's brother. The queen left England, and Stephen reigned quietly until 1152. Henry, the son of Matilda, then contested the throne and the long struggle ended in Stephen making Henry his heir. King Stephen died at Dover, October 25, 1154.

Stephens, Alexander H., an American statesman, was born in Georgia in 1812. He was a member of Congress from 1843 to 1856. He was opposed to secession and made a speech against it before the legislature of Georgia in November, 1860, and, when a delegate to the secession convention at Milledgeville in January, 1861, voted against the ordinance of secession. He was, however, elected vice-president of the Confederacy, and was one of the prominent statesmen of the seceding states. He was imprisoned at Fort Warren in Boston harbor for five months at the close of the war. He was in Congress from 1874 to 1882. when he was elected governor of Georgia. He died at Atlanta, Ga., March 4, 1883. In 1867-70 he published *A Constitutional View of the War between the States.* See *Life* by Cleveland.

Stephens, James. See FENIANS, ENGLAND, GREAT BRITAIN and IRELAND.

Ste'phenson, George, is usually spoken of as only the inventor of the locomotive, with the implication that it required no extraordinary genius to adapt the stationary engine of Watt to the work of locomotion. That is not true. There were difficulties to overcome that scientific men long thought to be insuperable — the direct transmission of power to the wheels and the securing of sufficient friction between wheels and rail to prevent slipping. The fact that Stephenson also invented the rail and roadbed and initiated the entire system of civil engineering as applied to railroad-building is commonly overlooked to-day. During his life the two achievements were inseparable and equally honored, as they should continue to be. Without the properly constructed, level road-bed, laid with iron rails, the locomotive must long have remained of limited use.

GEORGE STEPHENSON

Of all the great inventors Arkwright alone had as humble a beginning as Stephenson. To be born the son of a fireman of a colliery's pumping-engine, whose earnings never exceeded three dollars (12 shillings) a week, would seem to condemn one to a life of poverty, ignorance and obscure toil. It was on the 9th of June, 1781, that George Stephenson was born in the wretched mining-village of Wylam, near Newcastle, England. One room in a cottage, near the pit-mouth, that sheltered three other families was the home of his parents and six children. School was not to be thought of; bread was not always to be had in sufficent quantity. In this grimy village he spent his babyhood; childhood saw him below ground. At 14 he was promoted to be his father's assistant at a shilling a day. At 17 he himself was an engineman at two shillings, with his father under him as fireman. He began at once to study his steam-pump. Every idle day he spent in taking it to pieces, cleaning and repairing it. Eager to add to his knowledge of engines and steam he hired a poor schoolmaster to teach him to read. He soon raised himself to manager of the hoisting-engine at the pit-mouth. Thorough preparation and one step at a time marked his entire life. At 23 he was in charge of a Watt-engine in a spinning-mill. At 32

he was earning $500 a year, and the first use he made of it was to put his son Robert to school. At night he continued his own education under the boy's instruction. Father and son read, drew, modeled and experimented in physics together.

About this time a locomotive having a toothed wheel to grip a toothed rail was installed in a neighboring colliery. Stephenson thought a smooth wheel would run on a fairly level road, the weight of the engine supplying the necessary friction. In 1815 he patented his first model in which, in addition to the smooth wheel, he incorporated the principles of high steam-pressure by using the waste steam as a blast. He also secured simple and direct transmission of power to the wheels and joint-action of all with the connecting-rod. The multitubular boiler, so as to expose a larger surface to the fire, was added later. Having invented the locomotive, he had next to train workmen, as did Watt, to make it properly. Above all, he had to find a partner to supply the money. Next he turned his attention to the railroad. Long experiments were necessary before the first wrought-iron rail was laid with specially invented joints. The next difficulty was the securing of a level road-bed. The first railroad he built was one of eight miles in length for a colliery. Stationary engines were used to pull the loaded cars up steep gradients. In descending the cars ran by gravity and pulled empty cars up a parallel track. In 1825 Stephenson built his second short railway for a colliery district, attained a speed of 15 miles an hour on level stretches, and started a factory for building locomotives. Then came the first passenger-and-freight line between Liverpool and Manchester and the first attempt at modern railway engineering The work involved carrying the line across Chat Moss, a stretch of bog-land, making a deep cut through the red sandstone of Olive Mount and tunnelling under Liverpool for a mile and a half. In this work Stephenson displayed a resolution, a resourcefulness and an ability to control men and initiate methods then unheard of in modern life. The line was opened in 1830, with eight of Stephenson's engines of the *Rocket* type in the procession. His work called forth the most extravagant praise and wonder. It was compared in magnitude and difficulty with the work of ancient Egypt and Babylon. Yet this was only a beginning. Forty-nine years old at the time of the opening of the Liverpool and Manchester Line, Stephenson continued to build roads and locomotives and to improve them and to overcome greater engineering difficulties for the next 15 years. His surplus wealth and leisure he employed in developing coal-mines, burning lime and managing a large country-estate. He made flying trips to Europe to lay out the first lines in Belgium and Spain. He bridged Menai Straits at Holyhead, Anglesey, and carried a railroad across. He lived to see his son succeed him worthily. He died on August 12, 1848, honored as much for his character as for the benefits he conferred. Consult *Life*, in *Heroes of Science*, by T. C. Lewis and *Life* (revised edition) by Smiles in Volume III of *Lives of Engineers*.

Stephenson, Robert, the son of George Stephenson, was born near Newcastle-upon-Tyne, England, Oct. 16, 1803. He helped his father in the survey of his first railroad and spent three years as civil engineer in South America. On his return he had charge of his father's locomotive-works and assisted in building the famous *Rocket*, which won the prize as the best engine at the opening of the first passenger railroad in England. He was his father's assistant in all the railroad-building that followed and rose to the highest rank in his profession. Among his great works are Britannia and Conway tubular bridges, the Victoria bridge at Montreal and two bridges across the Nile at Damietta. He was a member of Parliament, received many honors from abroad, and at his death, Oct. 12, 1859, was buried in Westminster Abbey. See *Lives of Engineers, Volume Five*, by Smiles and *Life of Robert Stephenson* by Jeaffreson.

Stereopticon (*stĕ'rĕ-ŏp'tĭ-kŏn*). See MAGIC-LANTERN.

Ste'reoscope, an instrument which combines two different pictures of the same object into one, making it appear solid. Two photographs are taken of the object, one as it appears when looked at with the right eye and the other as it looks with the left. These are transposed, that is, the right picture placed on the left and vice versa, mounted, and introduced into an instrument having a double lens or a single lens cut in two, which makes the two images blend into one and stand out as they seem to when looked at by the eye alone. The lenses act as magnifying glasses, and also incline toward each other, which helps to blend the pictures The stereoscope was first invented in 1838 by Sir Charles Wheatstone. See *Stereoscope* by Brewster.

Ste'reoty'ping is the art of making solid casts of pages of movable type, to be used in printing. When the pages of matter to be printed are ready for the press, casts are taken from them, either in type-metal or in copper. Type-metal, which is used in stereotyping, is an alloy of lead, antimony, tin and, sometimes, copper, and is much cheaper than copper, which, however, is the more durable and so is used where large numbers are to be printed. Taking the casts of the printed sheets in copper is called electrotyping (which see). Stereotyping was invented by William Ged, an Edin-

burgh goldsmith, about 1725. A cast is first made by pouring a mixture of plaster of paris and water over the types and, when it is hardened or set, taking it off and drying it in an oven. This cast, which is a perfect copy of the page to be printed, is dipped into the melted type-metal, forming a cast of the metal, which is trimmed and planed to fit the block on which it is to be mounted. This cast is called a stereotype plate. The process used now is the invention of Genoux in 1829, called the *papier maché* process. It is much cheaper and more rapid, and has come into general use. Folds of soft, thin paper, pasted together and wet, are laid on the face of the type and beaten with a hard brush, so as to fit in all the holes in the type. The hollows made in this way on the outside of the paper are filled with clay and brown paper pasted over, and the whole is dried till it can be lifted off the type, when the cast of type metal is made from it by pouring in the hot metal. The paper cast can be kept and any number of new casts made from it. In printing newspapers the stereotype plates are made to fit round a cylinder, and the paper is pressed into the holes of the type by a roller. In large newspaper-offices a cast can be made in three to five minutes. See *Stereotyping and Electrotyping* by Wilson.

Ster'ilizing Processes are intended to destroy the micro-organisms to which fermentations and often diseases are due. Louis Pasteur (see PASTEUR INSTITUTE) was the originator of the theory and practice of these processes. Milk is the chief food which needs to be sterilized, both for the wide range of its use and the nature of the diseases which it may help to convey, as consumption, typhoid fever, diarrhœa in children, scarlet fever and cholera. Milk may be pasteurized at a temperature of 167° F. Boiling and treatment with superheated steam are even surer methods. Freezing assists to sterilize milk; but is less sure. Water is most conveniently sterilized by boiling. There can be no doubt that sterilization is one of the great, general advantages of the process of *cooking* food. Chemicals ought not to be used in sterilizing processes; for it is necessary to employ them, if at all, in quantities too large for health.

Ster'ling, Ill., a city in Whiteside County, on Rock River and the Chic., Burl. and Quincy and Chic. and Northwestern railways, 110 miles west of Chicago. Among its public institutions it includes good schools and a well-equipped library. Its industries embrace machinery, hardware, agricultural implements, paper and flour mills, canned goods, watches, caskets and a foundry. Population 7,467.

Stern'burg, Hermann von Speck, a German diplomat, born at Leeds, England, in 1852, and educated in Saxony and at Potsdam Military Academy. He took part in the Franco-Prussian War in the 2d Dragoons of Saxony, and in 1890 was drawn to official life, first as secretary of the legation at Peking, and secondly as *chargé-d'affaires* at Belgrade, Servia, and then as first-secretary of the embassy at Washington, D. C.; subsequently becoming envoy extraordinary to the United States in 1903 and, in the same year, ambassador. In 1898 he acted on the Samoan Commission, and in 1900 was consul-general for British India and Ceylon. He died in 1908.

Sterne, Laurence, a British writer, was born at Clonmel, Ireland, Nov. 24, 1713. He studied at Cambridge and became a clergyman. In 1759 he wrote the first two volumes of the *Life and Opinions of Tristram Shandy*, which has made him forever famous. Its success was signal and he became the "lion" of the fashionable world. The other two volumes followed in the same year and were as heartily welcomed as the earlier ones. The remainder of the work, which reached nine volumes, was written at Coxwold, where he had moved from his Yorkshire parish. *A Sentimental Journey through France and Italy*, published in 1768, was the result of a tour through those countries in 1765. He also published two volumes of sermons. His fame rests on his humor and the immortal characters of Corporal Trim, Yorick and My Uncle Toby, found in *Tristram Shandy*. He died at London, March 18, 1768. See *Life* by Fitzgerald and *Sterne*, in the English Men of Letters Series, by Traill.

Stettin (*stĕt-tēn'*), a Prussian city, is the capital of Pomerania. It is on the Oder, 60 miles northeast of Berlin. The citadel and several forts which formed the ancient fortifications were removed in 1874. The churches of St. Peter (1124) and St. James, founded in the 14th century, the palace, town-hall, two ornamental arches and several fine squares are among the noticeable features. It is one of the chief seaports of Germany, and manufactures soap, matches, clothing, sugar, paper, sewing-machines and bricks; has oil-refineries; and engages extensively in shipbuilding. Stettin was the seat of a princely dynasty, 1107-1637; was occupied by Sweden, 1648-1720; and by the French, 1806-13. Population 236,145.

Steu'ben, Frederic William Augustus, Baron, a general in the Revolutionary War, was born at Magdeburg, Prussia, Nov. 15, 1730. He served when only 14 in the siege of Prague, and rose in the army until in 1752 he was on the staff of Frederick the Great. He came to America in 1778 and offered his services to Washington, who gladly accepted them, as it was in the dark days of Valley Forge. He was appointed inspector-general, and remodeled the army. He took part in the siege of Yorktown, and

spent his whole fortune in clothing his men. Congress in 1790 voted him $2,400 yearly and a township of land near Utica, N. Y., where he died on Nov. 28, 1794. See *Life* by Kapp.

Steu'benville, O., a city, county-seat of Jefferson County, is on the Ohio, 68 miles below Pittsburgh, by rail 43 miles from Pittsburgh. It is in a rich farming-country, with large coal-mines and natural gas, and has a large trade. It stands high on the right bank of the river, is well laid-out, and has foundries, machine-shops, rolling-mills, tin and paper mills, blast-furnaces, boiler-works and factories of nails, glass, pottery, white lead and beer. The city is built on the site of Fort Steuben, which was erected in 1787 and named after Baron Steuben. The permanent settlement was made in 1797. It is served by three railroads and three interurban lines. Population 22,391

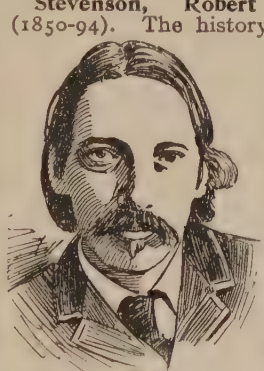
Ste'vens, Alfred, an English sculptor, was born at Blandford, Dorset, England, in 1818. His great work, which ranks him among the great sculptors of England, is the monument of Wellington for St. Paul's Cathedral, London, one of the finest pieces of modeling in England in the 19th century. It was begun in 1856, but was left unfinished at his death on May 1, 1875. In 1892 it was moved from the side chapel, where it had been almost hidden, to the place for which it was originally intended. See *Alfred Stevens* by Stannus.

Stevens Point, Wis., a town, county-seat of Portage County, is on Wisconsin River, 161 miles northwest of Milwaukee. It has a lumber-trade and a number of lumber-mills, besides furniture-factories, foundries, machine-shops, railroad-shops and flour-mills. It has public and parochial schools, a high-school, a commercial school and public library. One of the normal schools of Wisconsin is here. Pop. 8,692.

Stevens, Thaddeus, American statesman, Republican and antislavery man, was born at Peacham, Vt., April 4, 1792, and died at Washington, D. C., Aug. 11, 1868. After graduating in 1814 at Dartmouth College, he studied law and practiced at Gettysburg, Pa., and was subsequently drawn into politics, serving for a time in the state legislature in the Whig interest and becoming an active advocate of the public-school system. In the Whig interest he later served several terms in Congress, and meanwhile removed to Lancaster, Pa., where he rose to a prominent position at the bar. In Congress, in 1850, he opposed the Clay compromise measures, including the fugitive-slave law. In 1858 he was returned to Congress as a Republican, and became one of the ablest leaders of that party, manifesting great powers as an orator. He was a pronounced advocate of emancipation and the enfranchisement of the negro; was bitterly hostile to the seceding states; and stringent in his proceedings against them. He lived to take an active part in the unsuccessful impeachment of President Johnson and to see the readmission into the Union of the first group of reconstructed states. Though skeptical in his religious opinions, he was reverent in his attitude to Christianity — the devout faith of his mother. Part of his estate he bequeathed to an orphan-asylum at Lancaster, Pa., to be open both to white and colored children.

Ste'venson, Adlai E., was born in Christian County, Ky., Oct. 23, 1835. After graduating at Central College, he studied law and was admitted to the bar in 1858. He began the practice of law in Metamora, Ill., and remained there for ten years. He then removed to Bloomington, and was elected Congressman for that district in 1874 and 1878. He was appointed first assistant postmaster-general in 1885 by President Cleveland, and in 1892 was elected vice-president of the United States on the Democratic ticket with Grover Cleveland. He was candidate for governor of Illinois in 1908. He died June 13, 1914.

Stevenson, Robert Louis Balfour (1850-94). The history of English literature records no braver story than the life and work of this blithe story-teller, tender poet and charming essayist. Born in Edinburgh, Scotland, November 13, 1850, he spent much of his childhood in bed, with but the frailest hold on life. He died at the early age of 44. Within a period of 20 years, while waging one long fight with death, he produced an enormous quantity of work of enduring quality. Constant pain and over-powering weakness he did not permit to affect a cheerful spirit, nor to quench the flame of joy that burns in every line he wrote. In the autobiographical poems entitled *A Child's Garden of Verse* Stevenson shows how, shut-away from ordinary childish pleasures, he created a wonder-world of romance out of the simplest things. His bed was "the *pleasant* land of counterpane," not a weariness. Always happy, he was a source of happiness, if of anxiety, to his father and mother, to good Aunt Balfour and to his Scotch nurse who never had the heart to be cross with the "wee, winsome laddie."



ROBERT STEVENSON

When he grew older, he was able to take the course in Edinburgh University and to study engineering and law, but no regular study was possible in childhood. So he lived

much of the time in a beautiful country-home or took journeys with his father, a civil engineer, inspecting lighthouses and harbors about the wild coast. In this way his brain was filled with images of mountain, moor and sea-girt isles, rather than with the symbols in books. His frail health very early settled the question of his carrying on his father's business of engineering or of practicing law. At 24 he was ordered south. Under that title his first essay appeared in an English magazine. "Ordered South" practically was a sentence of death from tuberculosis. The essay recognized this, but it was brave in tone, of polished style, exquisite in its English. The joyous spirit of the youth, pulsating with keen life, refused to accept the verdict. Always afterward he was journeying southward in search of warmer climes, to France, the south of England, California and finally to Samoa in the South Pacific, his heart hungering for Scotland to the last.

That exquisite little classic, *Will o' the Mill*, was published in a magazine in 1873; then came essays, short stories, books of travel. By 1880 his talent had developed to the point of producing *The Merry Men*. In the next ten years *The New Arabian Nights*, *Treasure Island*, *Dr. Jekyll and Mr. Hyde*, *Prince Otto* and *The Master of Ballantrae* followed each other in rapid succession, with *The Child's Garden of Verse*, short stories, poems, essays, each more brilliant than the last and presenting a new facet of his mind. In *Kidnapped* (1886) he made Alan Breck, his hero, say: "Am I no' a bonnie fighter?" In 1890 the sympathy and affection of the English-speaking world followed their "bonnie fighter" across the South Seas with the shadow of death in pursuit. He asked but to live, to love, to work. He gained four years more for heroic struggle on the seagirt mountainside, at Vailima, above Apia. There, in "plain agony of body," when at times the composition of a paragraph made him break into a cold sweat, he wrote *The Island Nights' Entertainment*, *Catriona*, *St. Ives* and *Vailima Letters*, and began *Weir of Hermiston*. Everything he wrote gives the impression of life at full flood, as if he enjoyed the writing as much as we the reading. The story was the thing. He had no lesson to teach, except that of intense interest in life and men and events; joyousness, gay courage, comradery, unselfishness, the adding of a little pleasure to the world's store.

So he died on Dec. 3, 1894, the flame bright till the last moment. His wife and mother and step-children, who had lived but for him, unable to remain where he had passed away, abandoned the South-Sea home to the wild. Him they laid away on Vaea Mountain, Samoa. Forty natives who had loved him cut a path to the summit with their knives and axes. There he lies to-day in the green place of trees and birds and wind-swept solitude in a wide prospect of mountain, sea and sky, with one of his own brave verse for an epitaph:

> Under the wide and starry sky
> Dig the grave and let me lie.
> Glad did I live, and glad will I die,
> And I lay me down with a will.

Stevinns, Simon, a Dutch mathematician, statesman and soldier, born 1548; died 1620. Very little is known of his early career. His achievements principally are the following: 1. He invented a number of ingenious proofs for certain theorems in statics and hydrostatics. He also constructed a carriage which was successfully operated by sails. 2. He left an important treatise upon the subject of fortifications. 3. He introduced and advanced the use of (but did not invent) the system of double-entry in bookkeeping and the use of decimal fractions. He held a number of important offices under the Dutch government. For a detailed account of his work in science see Mach's *Science of Mechanics*.

Stew'art, Balfour, a British scientist, was born at Edinburgh, Nov. 1, 1828. In 1859 he was in charge of Kerr Observatory, and in 1870 was professor of physics at Owens College, Manchester. He is known as one of the founders of spectrum-analysis, and his name is associated with such subjects as terrestrial magnetism and the relation between sun-spots and temperature. His *Treatise on Heat*, *Elements of Physics* and *Conservation of Energy* were used as textbooks. He died at Drogheda, in Ireland, Dec. 19, 1887.

Stewart, William Morris, United States senator and lawyer, was born at Lyons, N. Y., Aug. 9, 1827, spent his early life in Ohio, and entered Yale College; but before graduating was attracted by the gold-discoveries in California, and proceeded thither in 1850. He mined in Nevada County and amassed wealth, after which he studied law and was admitted to the bar. In 1854 he was attorney-general; but some years later he removed to Virginia City, Nev., and became interested once more in mining and in the development of the famous Comstock lode. In 1861 he was chosen a member of the territorial council, and two years later member of the constitutional convention. From 1864 to 1875 he was United States senator, and became prominent as a free-coinage advocate. Meanwhile he resumed the practice of his profession, though, in 1887, he was again elected to the United States senate, serving until 1905.

Stickleback (*stĭk'k'l-băk'*), the name for small fishes with spines on the back. There are about 20 species, all inhabiting the northern hemisphere, and their spines vary from two to 15. They live in fresh, brackish and salt waters. The common fresh-water

stickleback is about four inches long, with three or four spines, It is abundant in streams in the United States and in Europe. In America it ranges from New York to Greenland. The brook-stickleback is abundant in small brooks from New York to Kansas and North to Greenland. Its length is two and one half inches, and there are five spines on the back. The largest stickleback is the many-spined stickleback, a salt-water fish found on the eastern side of the Atlantic. Nearly all sticklebacks are nest-builders. The males alone build the nests and guard them. They are provided with glands which open on the ventral surface, secreting a gelatinous substance used in holding the parts of the nest together. The nest is made of stems of water-plants and is attached to a stationary object. It is barrel-shaped with two openings, through which a current of water continually passes. Several females deposit eggs in one nest in different layers, They are fertilized by the male as soon as laid. He keeps guard, not only while the eggs are hatching but after the young fish are born.

Stig'ma (in plants), a specially constructed surface in connection with the carpel, for receiving the pollen. The surface is composed of papillate outgrowths which secrete a sugary solution. By means of this solution the pollen-grains are held and nourished for the development of the pollen-tubes. The stigma usually occupies some special region of the style, either its more or less broadened apex or a line or band down one side. See FLOWER.

Stilicho (*stĭl'ĭ-kō*), **Flavius,** a famous Roman general, was born about 359 A. D. He rose rapidly, and in 384 was sent as ambassador to Persia. In 394 he was governor of the western empire, as guardian of Honorius, the son of the emperor, who had been given into his charge by Theodosius. On the death of Theodosius he marched against Alaric, and also procured the death of Rufinus, his rival, who had command of the eastern empire. He again attacked Alaric in northern Italy, defeating him at Pollentia and Verona (403). He desired to help his own family to the imperial succession by marrying his son to the daughter of Theodosius, as he had already succeeded in marrying his daughter to the son of Honorius. To forward this plan he made an alliance with Alaric, but the great inroad of 200,000 barbarians compelled him to abandon his alliance. He forced them to surrender, and large numbers were sold as slaves. Honorius, the emperor, was excited against Stilicho by an enemy of his at court, and the army was induced to revolt. Stilicho fled to Ravenna, where he was murdered on Aug. 23, 408. Three months after his death Alaric and his Goths were at the gates of Rome.

Still'water, Minn., county-seat of Washington County, on St. Croix River, 18 miles by railroad from St Paul. It has the lumber trade of the St. Croix valley, and has flour mills, sawmills, a foundry, an extensive traction-engine and thrashing-machine factory, shoe and wood-furnishing factories and the Minnesota prison. Population 10,198.

Stipule (*stip'ūl*), a constituent part of many foliage-leaves, usually occurring as a pair of small, more or less leafy outgrowths on each side of the base of the petiole, as in clover. Sometimes stipules become much modified, as when, in the smartweeds they unite about the stem and form a short sheath, or when they appear as thorn-like processes. They are very constant in their occurrence in certain groups of plants, and therefore are of considerable service in classification.

Stir'ling, a town of Scotland, on the River Forth, 29 miles from Glasgow. The castle stands on Castle Hill, 420 feet above the sea. Most of the present castle belongs to the days of the Stuarts, whose sovereigns often kept court there. There are the Douglas room where Earl Douglas was stabbed by James II in 1452; the parliament-hall of James III; the palace of James V and the chapel of James VI; the church of the Holy Cross; the statue of Bruce; the guild-hall; the old and the new bridge; and Smith Institute, with art-gallery, reading-room and museum. The town is connected with nearly all the most important events in Scottish history: the deaths of Alexander I and William the Lion; Wallace's victory at Stirling Bridge; a siege of the castle by Edward I; the birth of James II and of James V; crowning of Queen Mary; the slaughter of Lennox; and the capture of the castle by Monk. Stirling has manufactures of tartans, tweeds, carpets and agricultural implements. Population 18,895. See *History of the Chapel Royal of Stirling.*

Stirling, James Hutchinson, a modern Scottish philosopher, was born at Glasgow, June 22, 1820. He studied medicine and practiced a short time in Wales. He went to Germany to study philosophy, his first work, *The Secret of Hegel,* published in 1865, giving him at once a high rank among philosophers. He has also written a *Text-book to Kant; Sir William Hamilton,* an attack on his philosophy of perception; *Lectures on the Philosophy of Law;* and *As Regards Protoplasm.* Other miscellaneous works are *Jerrold, Tennyson, Macaulay* and *Burns in Drama.*

Stock'holm, the capital of Sweden, is built on several islands and a part of the mainland, between a bay of the Baltic and Lake Malar. It is considered one of the most picturesque sites in Europe. The palace, dating to 1697, St. Nicholas church in which the kings are crowned, the House of Nobles, the town-house and a mag-

nificent granite quay are on the island called the Town; the Knight's island, west of the Town, is occupied by public buildings, as the houses of parliament, the old Franciscan church in which many of the kings of Sweden have been buried, and the chief law-courts. In Norrmalm, a district north of these islands, are the national museum with very valuable collections of antiquities, coins and paintings, the academy of fine arts, Hop Garden with a statue of Linnæus, the Royal Library of 250,000 volumes and an observatory. Ship Island, lying east of the Town island, is the headquarters of the Swedish navy, and still farther east is the beautiful island of the zoölogical gardens. The islands are connected with each other and the mainland by bridges, and small steamers ply rapidly between them. The islands and channels make Stockholm the Venice of the north. Though the harbors are closed for three or four months every winter, there is a large trade, with considerable manufacturing of sugar, tobacco, silks, ribbons, candles, linen, cotton and leather. Stockholm was founded by Birger Jarl in 1255, besieged by the Danes in 1389, and captured by Christian II of Denmark in 1520, when a terrible massacre followed, known as "the bloodbath of Stockholm." The city contains 341,986 inhabitants, the mass of whom are Scandinavians and Protestants and adhere to the Lutheran church. There are a state faculty of medicine with 273 students and a private philosophical faculty. Public elementary education is free and compulsory, and all children not attending the public schools must furnish proofs of having been privately educated. See SWEDEN.

Stock'port, a city in England, 37 miles east of Liverpool. It is built on the slopes of a deep ravine where two small rivers unite to form the Mersey, which is here crossed by a railroad viaduct, 111 feet high and 1,875 feet long. There are a 14th-century church, rebuilt in 1817, market-hall, free library, museum and St. Peter's square, with a statue of Richard Cobden. Stockport was the site first of a Roman station, then of a Norman castle, which was taken by Prince Rupert in 1644. It is an important seat of the cotton-industry, and has grown rapidly in spite of riots and strikes and the cotton-famine of 1861–4. There also are iron and brass foundries, engine and machine shops. Population 108,693.

Stock'-Raising. One of the most important industries in the United States; closely associated with agriculture, though some stock is yet sent to market directly from the western pasture-lands. East of the Alleghenies not much stock is raised for market, but large herds of dairy-cattle are found, while every farm has a few horses, hogs, sheep and cows to supply home needs. The Mississippi Valley and the western plains produce vast wealth in stock every year.

In America the pig has been coëxtensive with Indian corn, the greatest of food-crops. Consequently Chester County, Pa., developed the first truly American breed of swine, the Chester White, while Miami Valley, Ohio, about 1860 produced the well-known Poland China hog. The Miami Valley then was the world's corn and hog center, Cincinnati the chief American market. As the prairie states, however, were settled, a sudden change occurred in stock-raising. Indian corn spread to the arid plains, the bison disappeared and the steer and the hog followed corn to the boundary of cultivation. Then the ox went alone across "the Great American Desert" to the Rockies, and from 1870 to 1890 countless herds of cattle grazed from the Rio Grande to Canada. By 1900, however, the settlement even of "the far west" had ended this free ranging. Now the range-business is confined to producing feeders and shipping them eastward to be fattened in the corn-belt of Iowa and Illinois. The ruined grazing-lands of the southwest are being restocked with native grasses, and in Montana, North Dakota and South Dakota horses are raised on the prairie-pastures as extensively as cattle and sheep once were.

So American stock-raising has developed into the most gigantic live-stock industry ever known. The grass-lands of the far west and the corn-belt of the central west complement each other, each supplying what the other lacks. Land unfit for cultivation, where grass is cheap but corn and shelter wanting, is utilized for producing cattle and sheep. Breeding-herds that supply superior sires and dams are raised in the corn-belt, and this is the finishing or fattening ground for the stock from the western ranches. So Chicago, Omaha and Kansas City have become the markets for this immense industry. (See STOCK-YARDS). The prairie-pastures can, indeed, fatten sheep, finish many kinds of horses or even put fairly-good cattle into the market; but the cost of shipping live-stock from the range to the finishing ground is so great that live-stock must both be produced and finished at each place. Consequently farmers are breeding their own stock and developing it as part of the system of enriching their land. The meat-supply of the United States must henceforth be raised on the American farm; and live-stock is accompanied by leguminous crops (which animals alone can eat), which are the only feasible means of cheaply maintaining the nitrogen-supply and fertility of the soil. Hence stock-raising will play a larger and ever larger part in American farming.

The vastness of the live-stock industry in the United States is shown by the following statistics of domestic animals in 1910: Cattle (cows, bulls, etc.) 61,225,791; horses and colts 19,731,060; mules 4,183,572; asses and burros 110,012; sheep 51,809,068; swine 58,600,632; and goats 1,948,952. See AGRICULTURE (*Stock-Breeding* and *Stock-Feeding*, p. 31); CATTLE; HOG; HORSE; MEAT-PACKING; MILK; MULE; SHEEP; SWINE; and WOOL.

Stocks are the rights in the property of a corporation which those persons possess who have contributed to its capital. Each corporation has a certain capital-stock which may be raised for the purposes of its business but need not be fully paid up. This amount is divided into shares. Certificates are made out for these shares, say $100 shares or $10 shares as the case may be. These certificates are sent to those who have paid up the capital, in proportion to the amount which they have paid. Thus if the stocks be at par, a man who had subscribed $1,000 to a certain stock would receive ten $100 certificates. But the business of the corporation may fall short of expectations; or it may exceed them. In the former case the value of the paper certificates will decrease; in the latter case it will increase. So a stock is rarely at par, *i. e.*, at such a mark that a hundred dollar certificate is worth exactly one hundred dollars. Stocks are liable to fluctuate in value not merely according to the value of the business which they represent, whether a mine, a railroad, a great commercial concern or what not, but according to the plentifulness or scarcity of money which is being invested.

There are many who almost gamble on the fluctuations of stocks. Some buy merely in order to sell; and it is to their interest to *bull* the stock or advance it in price. Others sell stock which perhaps they do not possess; believing that, by the time they will be compelled to hand over the stock, they will be able to buy it more cheaply than they have agreed to sell it. In the stock-market the former class are known as "bulls;" the latter as "bears." The mere manipulation of stock is undesirable. The member of the public who thinks that he can compete with the professional stockbrokers is likely to suffer heavy loss. He will do better to make a genuine investment in a stock, with the idea, not of selling, but of getting good interest on his money from the dividends which the stock pays out of the proceeds of the business which it represents. On every transaction in stock the buyer or seller pays one-eighth *per cent.* of the money which he pays or receives for the stock to a broker. The number of brokers in a stock-exchange is limited. Their seats are property, and may be inherited; but they are occasionally sold to a would-be broker. A seat in the New York Stock Exchange has sold for $88,000. See BOARD OF TRADE.

Stock'ton, Cal., county-seat of San Joaquin County, is on an arm of San Joaquin River. It has a good harbor, and the river is navigable at all seasons from San Francisco. The city is supplied with water by artesian wells. There are a convent, a state hospital and factories making ironware, flour, engines, cars, window-glass, leather, soap and carriages. The city is served by the Southern Pacific (Central Pacific), Santa Fé and Western Pacific railroads, as also by two traction-companies. The population is 42,000.

Stockton, Francis Richard, American author and humorist, was born at Philadelphia, April 5, 1834, and, after graduating at the high school of that city, took to journalism as a profession and to contributing to the magazines. Joining the staff of *Scribner's Monthly*, he wrote much for it and *St. Nicholas*, of which he became assistant-editor. In this appeared many of his delightful stories for the young. He became a prolific and industrious author, his stories revealing quaint but unobtrusive humor, with a brightly graphic quality and a literary style that commend his work to the educated and refined. His more prominent works embrace *Rudder Grange*, *The Lady or the Tiger*, *Pomona's Travels*, *The Casting Away of Mrs. Leeks and Mrs. Aleshine*, *The Dusantes*, *The Great Stone of Sardis*, *A Bicycle of Cathay* and *The Captain's Toll-Gate*. He died on April 20, 1902.

F. R. STOCKTON

Stockton, Robert Field, an American naval officer, was born at Princeton, N. J., in 1795. He entered the navy in 1811, went to Africa in 1821, and helped to secure the republic of Liberia for the American Colonization Society. He was sent to the West Indies against the pirates and served in the Mediterranean. In 1845 he was sent to the Pacific coast, and next year, with Frémont, conquered California for the United States. In 1851 he was elected United States senator. He died at Princeton, N. J., Oct. 7, 1866.

Stock-Yards. Enclosures in cities where live-stock is cared for on its way to market or at market. With the development of the central and western states arose the necessity for convenient markets for distribution and sale of the enormous production of live-stock of these regions. (See

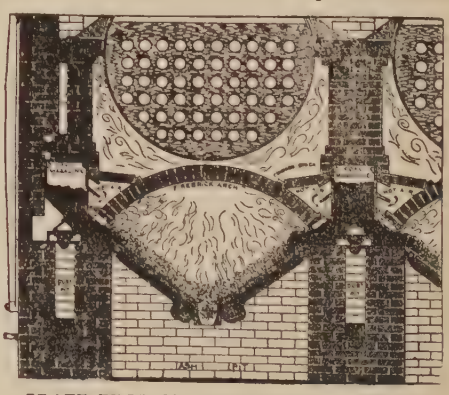
Stock-Raising). While all smaller cities had pens for the use of shippers and traders, great yards grew up in such centers as Cincinnati, Indianapolis, East St. Louis, Kansas City and Chicago, the latter outstripping all others, but those at Omaha and Kansas City being close seconds. Great slaughter- and packing-houses are found in connection with these large yards. The Union Stock-Yards of Chicago, with their 500 acres of yarding, 13,000 pens, 25 miles of street and 300 miles of railroad-track, are the largest live-stock market in the world. Thousands of carloads of stock arrive every day, most of it to be slaughtered, the remainder to be reshipped. The average number of hogs packed in Chicago annually for the past two decades is five million, considerably over one third of all packed in the world. In the year ending on March 1, 1910, there were 5,161,552 packed. The total value of the packing-house products of that city in 1909 was $325,062,000. There are 25,000 men employed. The disposition of filth from slaughter-houses has been a great sanitary problem. It has been almost completely solved, use now being made of every portion of the slaughtered animal. The strictest sanitary rules are enforced, and cleanliness prevails.

Stoddard, Charles Warren, an American author, was born on Aug. 7, 1843, at Rochester, N. Y. His education was obtained at the University of California. For some time he was an actor; then he became traveling correspondent of *The San Francisco Chronicle*. During this time he spent five years in the South Seas, and visited nearly every portion of the earth. He was professor of English literature at Notre Dame College, Indiana, from 1885 to 1887, and held the same position in The Catholic University of America at Washington, D. C., from 1889 to 1903. Among his publications are *South-Sea Idyls; Summer Cruising in the South Seas; The Lepers of Molokai;* and *Lazy Letters from Low Latitudes.*

Stod'dard, Richard Henry, American poet, critic and man-of-letters, was born at Hingham, Mass., July 2, 1825, and for a time attended school in New York, after which he worked as an iron-molder, meanwhile with love and assiduity cultivating the Muses. He subsequently held a position in the New York customhouse, was confidential clerk to General McClellan, city librarian in New York and reviewer for the New York *Mail and Express*. With poetic power, he possessed the true lyrical note, affluent imagination and much love of the beautiful. He was well-endowed as a critic, and his prose is that of a scholar and literary student. Many of his shorter poems have found their way into the heart, as *The Two Brides, The Flight of Youth, Along the Grassy Slope, Pain in Autumn* and *The Dead*. His chief published volumes embrace *The Book of the East, A Century After, Songs of Summer, Poems, Under the Evening Lamp, Adventures in Fairy-Land, The King's Bell, Life of Humboldt* and *Life of Washington Irving*. He also edited the *Bric-à-Brac* and *Sans Souci* series. He died on May 12, 1903. Consult his *Recollections*.

Sto'ics, philosophers who flourished first in Greece under Zeno, a native of Cyprus (340-260 B. C.), and later in Rome. They were so called from the porch or *Stoa Poacile* at Athens, where Zeno, their founder, walked and taught, with his chief disciples, Cleanthes and Chrysippus, developing and systemizing the Stoic doctrines. These doctrines sought to reconcile a theological pantheism and a materialist psychology with a logic which sought the foundation of knowledge in the perceptions of the senses and a morality which as its first principle claimed the freedom of the will. Zeno's associates, Cleanthes and Chrysippus, were taken to Rome by Panætius of Rhodes, one of whose disciples, Posidonius, instructed Cicero. Besides the latter, the other notable Roman Stoics who embraced Zeno's philosophy and made it a practical rule of life were Cato, Brutus, Seneca, Epictetus and Marcus Aurelius. Later Roman Stoics thought the supreme end of life was virtue; and that all emotion, being productive only of evil, must be subdued. This stringent attitude was by others relaxed, to the extent that their followers were advised to take part in political as well as social activities of all kinds — a departure, especially from the counsellings of the Epicureans, who on the contrary taught a life of retirement and contemplation.

Stok'ers (mechanical), an apparatus for feeding furnaces with coal by mechanism



GRATE-FEED OF A MECHANICAL STOKER

operated by power. Finely broken coal is used, and is ordinarily stored in elevated bins in front of or over the furnace. From these elevated bins it runs down through chutes into the coal-magazine of the stoker.

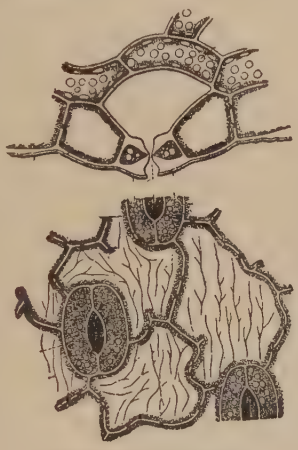
It is then fed regularly to the fire by some mechanism. In the Roney stoker coal is carried to the fire on a series of connected rocker-bars, arranged on an incline. In another common furnace the coal is pushed down the inclined sides of the furnace by an oscillating pushing-bar. The advantages of a mechanical stoker are that coal is fed more uniformly, smoking is decreased, a lower grade of coal can be used with advantage and hand-labor is saved. Mechanical stokers are to-day used in many large stationary furnaces.

Stoke-upon-Trent, a manufacturing town in Staffordshire, England, on Trent River. It is a modern town noted for its factories of porcelain, earthenware, tiles and tesselated pavements, which are among the largest in the world. Coal-mining, bricklaying and iron-works are also carried on. There are statues of Wedgwood and Minton in the city. Population 89,015. See *Borough of Stoke-upon-Trent* by Ward.

Stolon (*stō'lŏn*), a branch especially adapted for propagation, as in the ordinary houseleek. The houseleek, surrounded by its stolons, each bearing a young plant at its tip, is sometimes called "hen and chickens." An equivalent word is "offset."

Stom'ach, an organ of digestion, present in some form in all animals above the sponges, with the exception of a few degenerated parasites. It is merely a receptacle for the food, and is provided with glands which secrete a digestive fluid. Digestion however, is carried farther and completed in the intestine and, therefore, the stomach is not the sole organ of digestion. The stomach of the human body is a sac on the left side just below the diaphragm. It has four coats: an outer, firm, serous coat; a muscular coat, with fibers arranged in longitudinal, transverse and oblique directions; a coat of loosely woven fibrous tissue; and an inner, mucous coat. The glands which secrete the gastric juice are derived from the latter coat. There are two varieties, those nearer the heart, called cardiac glands, and those at the other end of the stomach where the intestine is joined, called the pyloric glands. The latter are the more important. The stomach is under control of the nervous system, both as to its movements and as to the secretion of gastric juice. When food is introduced into the stomach, the secretion of gastric juice is stimulated through the nervous system. The gastric juice contains a ferment called pepsin, which acts especially on proteids like lean meat, white of eggs, gluten of bread etc. This action takes place in the presence of acid, and in the glands are certain cells which provide hydrochloric acid in small amount. When this is deficient, grave stomach disorders arise. The food is reduced to a condition called chyme and is passed on into the intestine. The object of digestion is to render food soluble that it may pass by absorption through the walls of the stomach and intestine. This is not a process depending upon life, as it can be performed with artificial gastric juice outside the body. The characteristic action of the gastric juice is upon proteids, while the pancreatic juice, which is introduced into the intestine, is a universal digester, of greater efficiency than the gastric juice. It aids in the digestion of starches and fats as well as in completing that of the proteids.

Stomata (*stŏm'ȧ-tȧ*) (in plants). Narrow openings are developed in the epidermis of all aërial parts of plants which require and emit gases. (See AËRATION.) Gaseous exchanges especially abound in green tissues; hence stomata are chiefly displayed by the foliage-leaves of the higher plants. Each stoma consists of two specially organized epidermal cells, called guard-cells, which are crescentic in surface-view and, being in contact by their concave faces, leave a lens-shaped opening between them. This opening leads into the system of intercellular passageways among the working-cells, and thus provides for a free exchange of gaseous substances between the working-cells and the outside air. The guard-cells change form with the varying amounts of moisture in the air, and so regulate the size of the opening between them. Stomata have been called "automatic gateways" on account of this peculiar power of the guard-cells. See LEAF and TRANSPIRATION.



STOMATA AND LEAF

Stone-Age is a term used to designate a stage of culture in man's development, not a chronological period in geological history. It refers to the period among any people when the use of metals is unknown or, if known at all, does not involve the knowledge of smelting. At such a time stone is largely used in making implements and tools, though other materials, as wood, bone and shell are also employed. The stone age is known to have existed in Europe many hundreds of years ago; in North America it continued among the Indians until the 18th century; in some other places it probably exists at the present time.

The great mass of evidence for the stone age has been gathered in western Europe, and that period has been subdivided into the paleolithic (old-stone) and neolithic (new-stone) eras. During the earlier time the implements were rudely chipped and left rough and irregular; in the later time they were often highly polished and finished with great care. Paleolithic man is thought to have existed in southern Europe while much of the continent was covered with ice. His presence there is known by the chipped flints found in place in beds of gravel and loess of France, which Prestwick and Lyell identify as drift-formations from the early ice invasion. Neolithic implements, specimens of which are much more numerous, have been collected in the oldest lake-dwellings of Switzerland and especially in Denmark. They are nowhere associated with river gravels, nor have paleolithic remains been found in Denmark. In that country the polished stone-implements and bits of pottery found in the shell-heaps of *kjökken-möding* (kitchen-middens) indicate that man had reached a higher stage of culture by the time he had reached that region in his northward migration after the retreating ice-sheet. In America the same subdivision of periods has been attempted, but thus far the evidence seems to show the presence of neolithic man only. The specimens brought forward to prove the presence of paleolithic man seem to be rude "rejects" thrown aside before completion.

Stone-Circles or **Standing-Stones** are groups of stones, sometimes two or three standing alone and sometimes arranged in circles, found in Britain, Scandinavia, France and elsewhere. They were called druidical circles in Britain, cromlechs in France and dom-rings in Scandinavia. Sometimes they are bowlders rolled into place, and sometimes pillar-stones, fastened in position by smaller ones at the base. Sometimes there is a single circle, and again there will be one or two smaller circles within. Examination of these circles in Scotland proves that they were cemeteries of the bronze age. The largest stone-circle in Scotland is that of Stennis, Orkney. It is surrounded by a trench 30 feet wide and six feet deep, inclosing two and a half acres. There are 13 stones still standing, the highest being 14 feet.

Stone'henge is a circle of stones on Salisbury Plain, England, and was classed as one of the four wonders of England. It is a set of circles and oval figures. The first circle has pillars of stone about 13 feet high and four feet apart, and stones placed across on top. There are about 140 stones of the different circles, some being 23 feet high. It is also found to be a burial-place. The stone circles of Norway and Sweden seem to be burial-places of the iron age. The circles are rare south of the Baltic, there being only a few in France and Algeria. Consult Fergusson's *Rude Stone Monuments*.

Stone, Lucy (Blackwell), American reformer and advocate of woman's rights, was born at West Brookfield, Mass., Aug. 13, 1818, and died at Dorchester, Mass., Oct. 18, 1893. Graduating at Oberlin College in 1847, she devoted herself to advocacy of woman-suffrage and to antislavery, for which she became a zealous worker. She lectured widely in favor of woman-suffrage, organizing wherever she went local societies of the Woman's Suffrage Association, of which she was one of the founders as well as editor of the (Boston) *Woman's Journal*, its mouthpiece. She aided in organizing, in 1850, the first national woman's rights convention at Worcester, Mass., and was always zealous in the cause she held dear to her heart. In 1855 she married Henry B. Blackwell, though stipulating to bear her maiden name.

Stones, Precious, are mineral substances used in jewelry and for other ornamental purposes. They are called precious because of their rarity and expensiveness. The diamond, ruby, sapphire, oriental amethyst and emerald stand first in the list of precious stones, because of their brilliant color, luster, hardness, durability and rarity. The topaz, garnet, turquoise, tourmaline, opal, agate, jasper and onyx are of the second class, while there is still a large class of stones used for ornaments, as *lapis-lazuli*, malachite and the moonstone, which are not called precious stones. There also are two substances, derived from animals, used in jewelry: pearls and corals; and also amber, which is a fossil resin. The cutting and polishing of precious stones are necessary to bring out the sparkle and luster so highly valued. When the sparkle is desired, the stone is cut with many faces or facets, as in the diamond, but when the color is important, it is cut with a smooth and usually rounded surface. The hardness of the stone adds to its value, as it admits of a higher polish, retains it longer and wears better. The diamond is the hardest of the precious stones. The great value of these stones has led to many efforts to produce artificial imitations but without success. The usual imitations are made of a soft flint-glass, called stress or paste, which is colored and sometimes has thin plates of the real stone over or under it. See DIAMOND, PEARL and SAPPHIRE.

Stoneworts (*wûrtz*), the common name of species of *Characeæ* (*q. v.*)

Stony Point, a rocky point on Hudson River, 42 miles north of New York. There was a fort here, and one on the point opposite, during the Revolutionary War, which were captured by the British, but the Stony Point fort was retaken by Anthony Wayne in a bold night attack, July 16, 1779.

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GEM MINERALS

Turquoise.
Gold Stone.
Garnet.

Opal.

Crocidolite.
Blood Stone.
Amethyst.

Stor'age-Bat'tery, a form of voltaic battery in which the energy, when once used, may be replaced by a process known as charging.

Like almost every other form of voltaic cell, the storage-cell consists of two conductors of the first class and one of the second class. In this case the conductors of the first class are *lead* and *lead-peroxide*, while the conductor of the second class is a solution of sulphuric acid.

This form of voltaic cell was devised in 1860 by Planté, a Frenchman. He started with two lead plates in sulphuric acid. By passing an electric current from one of these plates through the acid to the other, he succeeded in oxidizing the anode, while the cathode remained metallic lead. By frequently changing the direction of the current passed through the cell the lead-plates were rendered porous and spongy and made to present a large surface. This process is known as forming the plates. Finally a current is passed through the cell in one direction until one plate is thoroughly oxidized, while the other remains spongy, metallic lead. This process is known as charging the cell.

The charging simply restores the oxygen to the positive plate and removes the oxygen from the negative plate. Voltaic cells are divided into two classes according as they require charging or not. Those which require charging are called *secondary* cells; while cells of the Daniell or Bunsen type, which are made up once for all and continue to work until one of the electrolytes or one of the electrodes is exhausted, are called *primary*.

In 1881 Faure devised a process of putting a paste of red lead (lead-peroxide) on the positive plate and shortening the process of forming. But in the very best cells of recent years there has been a partial return to the process of Planté. When a storage-cell is being used, the current *in the cell* flows from the spongy bed-plate to the plate which is covered with lead-peroxide (PbO_2). The result is that the former is oxidized and the latter reduced from lead-peroxide to lead-oxide. When all the peroxide is used, the cell must be charged again.

From the preceding it is evident that what is stored up in this cell is chemical energy, and not electricity, as is sometimes popularly supposed. The great merit of its storage-cell is its high electrical pressure, more than two volts, combined with a very low internal resistance. This low resistance permits the use of enormous currents without wasting much energy inside the cell.

Storage-cells are used for an endless variety of purposes; but their principal use may be reckoned as that of a "booster" in helping the dynamo during the busy hours at the electric-light station and the street-railway power-house. Many tons of storage-cells are employed also in driving automobiles and small launches. Storage-cells are often called accumulators.

Stork, a large, heron-like bird with bill much longer than the head and very stout at the base. The common migratory stork of Europe is the best-known member of the family. It is a friendly bird, nesting on housetops, old chimneys and steeples, as well as on tall trees, and is regarded as a bird of good omen. It breeds in Holland and Germany, but not in France,

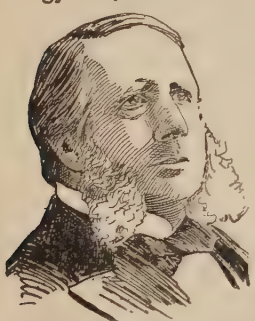
STORK

Italy or Russia. It is about three and one half feet long, white, except the wings which are partly black. In the autumn these birds gather in large flocks and migrate to Africa, where they spend the winter. They frequent marshy places and feed on frogs, fishes, snakes, slugs, young mammals and insects. There are about 20 species in tropical and temperate parts of the world. There is only one form that breeds in North America, the wood-ibis, which is about the length of the European stork. It is mainly white, with glossy black on the wings and tail. The head and upper part of the neck have no feathers and are of a dusky color. It breeds as far north as the southern limit of Illinois, and is an occasional summer-visitor farther north. See ADJUTANT-BIRD.

Storm, a violent disturbance of the weather, especially as regards wind and rain. By simultaneous observations of the barometer it has been found that the atmosphere of the earth is made of regions of high and regions of low pressure or, as they are called by meteorologists, anticyclones and cyclones respectively. It is the cyclones or regions of low pressure, rotating in the northern hemisphere in a direction contrary to the hands of a watch, that constitute most of our storms. In the United States these cyclones originate mostly in the region west and northwest of the Mississippi — between the Rocky Mountains and the Mississippi River or in the region about the Gulf of Mexico. Many of the storms of the Atlantic originate about the Gulf of St. Lawrence; while the storms of Great Britain take their rise mostly in the mid-Atlantic. From knowing the general trend and rate of motion of these cyclones and studying

the latest telegraphic reports the weather-forecaster is able to predict all large storms with admirable and increasing accuracy. Thus the usual storm-track in the United States is to the east and over the Great Lakes to the Gulf of St. Lawrence. There is a great variety of local storms, as the *typhoon* of the China Sea and the waters about the Philippine Islands, the wind-storms of Arabia, the *blizzards* or heavy snow-storms accompanied by driving winds, tornadoes etc. The entire subject of storms must, however, be yet considered as an imperfectly understood department of the imperfectly developed but highly important science of meteorology. See CYCLONE.

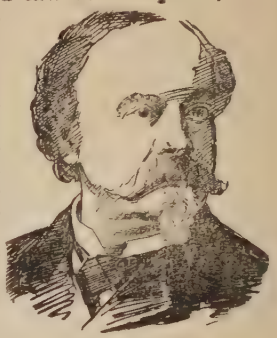
Storrs, Richard Salter, an American clergyman, was born at Braintree, Mass., Aug. 21, 1821. He studied at Amherst College and Andover Theological Seminary. He was pastor of the Church of the Pilgrims, Brooklyn, N. Y., 1846-99, having had one of the longest pastorates in the city. For a number of years he was one of the editors of *The New York Independent*, and was president of the American Board of Missions. He was noted for his eloquence and beautiful style in the pulpit and his aptness and readiness in occasional addresses, and ranked as one of the first pulpit-orators in America. His more important publications include a work on *The Divine Origin of Christianity*, *The Puritan Spirit*, *Bernard of Clairvaux* and *Forty Years of Pastoral Life*. He died on June 5, 1900.



RICHARD S. STORRS

Sto'ry, Joseph, an American jurist, was born at Marblehead, Mass., Sept. 18, 1779. He was a graduate of Harvard. He was in the legislature in 1805, and in 1808 entered Congress. He was made a judge in the supreme court of the United States in 1811, holding the position for 34 years. In 1829 he became a professor in Harvard Law-School. He was an authority on all legal questions in the United States, his *Commentaries on the Constitution of the United States*, *The Conflict of Laws* and *Equity Jurisprudence* being very valuable. He died at Cambridge, Mass., Sept 10, 1845. See *Life* by his son.

Story, William Wetmore, American sculptor and poet, was born at Salem, Mass., Feb. 19, 1819, son of Joseph Story, and after graduating at Harvard studied law and was admitted to the bar. Among his works as a lawyer are *Reports of Cases*, *Treatise on the Law of Contracts*, *The Law of Sale of Personal Property* with *The Life of Story*. In 1848 he abandoned law for sculpture, and to assist him in his study of fine models he removed to Rome, Italy, where he afterwards chiefly resided, until his death at Vallombrosa on Oct. 7, 1895. His allegorical statues of *Cleopatra*, *Medea*, *The African Sibyl* and *Semiramis;* statues of George Peabody, Edward Everett and Francis Scott Key; and busts of Lowell, Bryant, Theodore Parker, Josiah Quincy and his father represent the bulk of his achievement in art. In literature he published poems, essays and rambles in Italy. The chief of these works which show his culture and sympathies are *Roba di Roma*, *Conversations in a Studio*, *The Castle of St. Angelo and the Evil Eye*, *Poems*, *Excursions in Art and Letters* and *A Poet's Portfolio*. He died in 1895.



W. W. STORY

Stowe, Harriet Beecher, an American writer, was born at Litchfield, Conn., June 14, 1811. She belonged to the celebrated Beecher family, being the daughter of Dr. Lyman Beecher and the sister of Henry Ward Beecher. She was noted as a child for her fondness for writing, and at 12 astonished her teachers with a composition on the question: *Can the immortality of the soul be proved by the light of nature?* Moving to Cincinnati with her father's family, she there married Calvin E. Stowe, then a professor in Lane Theological Seminary. In that region and through the servants employed in her own family she learned much of the evils of slavery. Her husband's connection with many prominent abolitionists; his knowledge of the workings of "the underground railroad;" a pro-slavery riot in the city, when many of the intended victims were concealed and fed by herself and her friends; a sojourn of a brother in the south; and his observations on the slave-trade all helped to fit her for her work. Her first published volume was made up of sketches written for the papers and periodicals of the day, and was called

HARRIET BEECHER STOWE

The Mayflower. In 1850 her husband became a professor in Bowdoin College, Brunswick, Me., and there the great American novel of *Uncle Tom's Cabin* was written. The characters were, many of them, taken from life, and many incidents were obtained from her brother's journal of his southern tour, and others from the lips of fugitives from slavery. The story appeared first as a serial in *The National Era* at Washington, D. C., and made a great sensation, bringing the author unexpected fame and undreamed-of financial returns. It was translated into many foreign languages, including Russian, Polish, Wendish, Armenian, Arabic, Chinese and Japanese, and has been brought out on the stage repeatedly. More than a million copies, probably, have been printed in the English language. Besides its power as a story the book had a strong influence in bringing about the Civil War, as it opened the eyes of the people to the evils of the system of slavery. Other works of Mrs. Stowe's are *Dred, The Minister's Wooing, Agnes of Sorrento, Oldtown Folks* and *My Wife and I.* She died at Hartford, Conn., on July 1, 1896.

Strachan, J., was born in Aberdeen, Scotland, in 1778 and educated at its grammar school there. He graduated at Aberdeen University, studied theology at St. Andrews University and came to Canada in 1799 to assume the principalship of a university which Governor Simcoe hoped to establish in Toronto. The plan fell through temporarily, and Dr. Strachan opened a school in Kingston and continued it for three years. He afterwards opened a school in Cornwall. In 1812 he was appointed rector of York, in 1818 given a seat in the executive council, in 1825 appointed archdeacon of York, and in 1839 was created bishop of Toronto. In 1840 he resigned from the legislative council. The province owes him a great debt. Through his energy Trinity College was given to Toronto.

Stradivari (*strä dē-vä'rē*) or **Stradivarius, Antonio,** a celebrated Italian violin-maker, was born at Cremona in 1644. Besides violins, he made viols, guitars and mandolins. His instruments are known for their finish and fine tone. He was the first to finish them neatly on the inside. The great care with which he selected and cut his wood, the study he gave to the shape and proportions and the luster of the varnish used combined to make an instrument without a rival. They are carefully preserved by those possessing them, and bring great prices, ranging from $1,000 to $3,000. Stradivari died at Cremona, Dec. 17, 1737.

Straf'ford, Thomas Wentworth, Earl of, an English statesman, was born at London, April 13, 1593. He entered Parliament in 1614. In the struggle with Charles I he sided with the opposition, against "not the king, but his evil ministers." In 1628 he was made president of the Council of the North by Charles I and in 1652 governor of Ireland. There is much difference of opinion as to his administration. His aim was to make the king absolute in Ireland, and his system, called "thorough" by himself and Laud, was severe. But he brought the country into a prosperity unknown before or since. He raised the revenue, improved the army, cleared the seas of pirates and introduced the cultivation of flax, which still is the most important industry of Ireland. In 1639 he became the king's principal adviser. When the Long Parliament met in November, 1640, he was charged with high treason and imprisoned. His guilt was not proved, the principal charge, being his telling the king: "You have an army in Ireland that can reduce this kingdom," to which only one witness testified. But he was convicted as a man dangerous to the public liberties, and Charles gave his consent to the execution, not daring to refuse the popular clamor. He was executed on May 12, 1641. See *Life* by Foster in Eminent British Statesmen and Elizabeth Cooper.

Straits Settlements. See MALAKKA.

Strakosch (*strä'kosh*), **Clara Louise (Kellogg),** American operatic singer, was born at Sumterville, S. C., July 12, 1842, and received her musical education at New York, where she made her début at the Academy of Music in 1861. Pursuing her studies, she appeared in the season of 1864–5 as Marguerite in Gounod's *Faust,* as well as in *La Somnambula, Lucia di Lammermoor* and other operas, achieving great success. In 1867 she appeared also in England, where the wide range and perfection of her soprano voice attracted attention. Later on she organized an English-opera company, and with it appeared in the chief cities of this country and of Europe. Of recent years, after her marriage to Mr. Strakosch, she has appeared chiefly at concerts. Her repertoire once embraced about 40 operas.

Strass'burg, a city of Germany and, since 1871, the capital of Alsace-Lorraine, is on Ill River, two miles from the Rhine. It has been strongly fortified by the Germans, who rebuilt the citadel, dating back to 1682, and placed 14 forts on the surrounding heights. The finest building in the city is the cathedral founded in the 11th century but not finished until the 15th. It is one of the finest Gothic churches in the world, with a spire of open-stone work 466 feet high, a magnificent rose-window 42 feet across, and in the minster the wonderful astronomical clock. Other fine buildings are the Protestant Church of St. Thomas, the palace, the library, the arsenal and the new university. The uni-

versity was founded in 1621, and became famous, especially in medicine and the study of the languages, but was broken up during the French Revolution. In 1819 it was established again by the union of two academies, founded in 1803 and 1808. In 1872 it was reorganized as a German university, with new buildings, laboratories, a library of over 700,000 volumes, in place of the old one of 200,000 volumes which was entirely destroyed in the siege of 1870, a faculty of 151, and an attendance of 1,418 students in philosophy, jurisprudence, theology and medicine. As Strassburg stands near the borders of France, Germany and Switzerland, it has a large trade and a great variety of manufactures, including tanneries, foundries, chemical and locomotive works, piano and tobacco factories and many jewelry establishments.

Strassburg was colonized by the Romans during the reign of Augustus, and Julian here won a victory over the Alemanni in 357 A. D. It became a free town of the Holy Roman empire in the 13th century. In 1681 it was seized by the French and confirmed to them by the treaty of Ryswick. In 1870, after a siege of seven weeks, Strassburg surrendered to the Germans on Sept. 28. Population 167,678.

Strat'ford, Can., county-seat of Perth County, Ont., has a population of 9,959, and is a railway and industrial center of growing importance, surrounded by rich farming-land.

Stratford-on-Avon, a town in Warwickshire, England, 22 miles southeast of Birmingham, celebrated as the birthplace of Shakespeare. It stands on Avon River. "Shakespeare's house," where the poet was born, is on Henley Street, and belongs to the government, having been bought for $15,000 and restored. The old guild-hall was restored in 1892, and is occupied by the grammar-school of King Edward VI, where Shakespeare was educated. The old church, with Shakespeare's and Anne Hathaway's grave, also contains an American stained-glass window representing the "Seven Ages." The Shakespeare fountain was presented by George W. Childs, an American, in 1887; and Shakespeare Memorial Theater was built in 1877–9. Anne Hathaway's cottage, near by, also belongs to the nation. Stratford-on-Avon is an important agricultural center, but its prosperity depends largely on the visitors, who number 20,000 or more every year. Population 8,318. See *Sketch-Book* by Irving; *Our Old Home* by Hawthorne; *Stratford-on-Avon* by Lee.

Stratford de Red'cliffe (Sir Stratford Canning), an English diplomatist, was born at London, Nov. 4, 1786. He in 1812 negotiated the treaty between Russia and Turkey, which released the Russian army of the Danube in time to attack Napoleon on his retreat from Moscow. He was minister to the United States during 1819–23. In 1825 he was again sent to Constantinople; again, in 1831, on a mission to draw the boundaries of the new kingdom of Greece; and once more, from 1842 to 1858, he was ambassador at Constantinople. Here his influence was so great as to gain him the name of *The Great Elchi.* He induced the sultan to begin a series of reforms, which improved the condition of the native Christians, and made every effort to prevent the Crimean War. He retired from public service at its close and died on Aug. 14, 1880. See *Life* by Stanley Lane-Poole.

Strathco'na and Mount Royal, Lord, formerly known as Sir Donald A. Smith, high commissioner for Canada at London, was born in Scotland in 1820. He early in life entered the service of the Hudson Bay Company, and was the last resident-governor of that fur-trading corporation. For a time he represented Selkirk, Manitoba, in the Dominion Parliament and was a director of the Canadian Pacific Railroad Company. In the Boer War he raised the Strathcona Horse for service in South Africa, equipping 500 men at his own expense. He was known for his active philanthropy. He died in London Jan. 21, 1914.

Straus (*strous*), **Oscar Solomon,** an American merchant and diplomat, was born at Otterberg, Bavaria, in 1850. In 1854 his family emigrated to the United States. Lazarus Straus, the father, and Oscar made wholesale importations of pottery and glassware. Mr. Straus was educated at Columbia University. In 1887 he became minister to Turkey; returned home in 1889; and was re-appointed in 1897. Since 1902 he has been a member of the Court of Arbitration at The Hague. In 1907 he was appointed secretary of Commerce and Labor. He is the author of *The Origin of the Republican Form of Government in the United States; Roger Williams the Pioneer of Religious Liberty; The Development of Religious Liberty in the United States;* and *Reform in the Consular Service.*

Strauss, David Friedrich, a German writer, was born at Württemberg, Jan. 27, 1808. He began life as a country pastor, but after a year became professor in a seminary, and then went to Berlin for study. While teaching and lecturing at Tübingen, he published his *Life of Jesus* (1835), which aroused great excitement throughout Germany and resulted in his dismissal from his position. His next publications were defenses of his work, which were followed by his second great work: *Christian Doctrine of Belief.* He published lives of Schubart and Ulrich von Hütten, brilliant lectures on Voltaire and a new *Life of Jesus* (1864). *The Christ of Faith*

and *The Old and the New Faith* are his latest works. His style of writing places him very high among German writers. He died on Feb. 8, 1874. See *Life* by Zeller.

Strauss, Johann, Austrian dance-music composer and conductor, known familiarly as The Waltz-King, was born at Vienna, Oct. 25, 1825, and died there on June 3, 1899. He came of an eminently musical family, his father being a noted musician, while two of his brothers were composers of dance-music. On his father's death he became conductor, and toured the world with his own and his late father's orchestra. At the same time, from an early age, he composed waltzes and operettas, which have held the stage with great favor. In 1872 he conducted an orchestra of 1,000 performers at the Boston Peace Jubilee; he for a time also was musical director to Emperor Joseph at Vienna. His most famous waltz-pieces are *Wiener Blut, Künsterleben* and *An der schönen blauen Donau.* Of his operettas the following are best-known: *Indigo Cagliostro, La Tsigane, Die Fledermaus* (The Bat), *Der Lustige Krieg* (The Merry War), *Simplicius, Eine Nacht in Venedig* and *The Gypsy Baron.*

Strauss, Richard (1864–), a distinguished German composer and conductor, born at Munich, his father being the finest horn-player of his day. By musical critics Richard Strauss is variedly estimated, some esteeming his work but cacophony, while others recognize it as "the music of the future" and deem him the most eminent of living German musicians. In like manner, his *Domestic Symphony, Heldenleben* and other tone-poems have provoked the most acrimonious discussion; but much the same, it will be recalled, was said of Wagner and his work, and hence the balance must be struck midway between the two varied estimates current in regard to the author's productions and their effect on the ear of the listener and critic. In his earliest years Strauss was musical director at Meiningen, chapel-master twice at Munich, then at Berlin; and afterwards he occupied himself as a composer, and that of the ultra-modern school. His chief symphonic works include *Italia* (a fantasy), *Don Juan, Macbeth, Death and Apotheosis, Don Quixote, Thus Spake Zarathustra* and *A Hero's Life.* He has also published many songs (not far short of 50), and almost all have been very popular. Great successes also have been his operas of *Guntram, Feuersnot* and *Salome* (*q. v.*), adapted from Oscar Wilde's text, which reveal special gifts as an imaginative and daringly original composer. In 1905 Strauss paid a professional visit to this country, where he conducted many of his more admired compositions.

Straw is the stem of grasses, as wheat, oats and barley It is used on farms for feeding and for bedding animals. Its chief use in the arts is in making paper and hats. Wheat-straw is most used for plaiting, the process by which the straw is prepared for hats, bonnets and baskets. The straw is usually split into strips and plaited or braided by women and children. They are sold by the score or 20 yards in a piece. The finest straw-plaits are made in Tuscany, and are made from whole wheat. The wheat is sown very thickly and the crop pulled up and cut off by hand for threshing. The plaiting of the finer straws is so trying to the eyes that the plaiters cannot work more than two hours a day. Large quantities of straw-plait are also sent out from Canton, China. The straw-braids which are brought to this country are made into hats and bonnets by a machine which sews a hundred a day, and are pressed by another machine at the rate of four a minute. Panama hats are made from straw from the leaves of a palm, and are braided by the Indians in South America.

Straw'berry, species of *Fragaria*, a genus of the rose family. It contains about 12 species, which are found in the temperate regions of the northern and southern hemispheres. The fruit really is a much enlarged and fleshy receptacle, in the surface of which the very small, seed-like akenes are more or less imbedded. The strawberry is comparatively recent in cultivation, and in America it is said to be the most important of the small fruits. The ordinary commercial varieties are all from the Chilean strawberry (*F. Chiloensis*), whose name indicates its origin. The common, wild strawberry of the eastern United States was once extensively cultivated, but it has about passed into disuse.

Strea'tor, Ill., a city of La Salle County, the center of a productive agricultural and coal-mining district, 92 miles southwest of Chicago. It is served by the Chicago and Alton; Wabash; Chicago, Burlington and Quincy; Atchison, Topeka and Santa Fé; Illinois Valley and Northern; Chicago, Ottawa and Peoria (Interurban), and Chicago, Indiana and Southern railways. It has foundries and machine-shops; flour and planing mills; brick, tile and sewer-pipe works; and manufactories of flint and Bohemian ware, window and rolled plate glass, automobile and automobile accessories and locomotive-repair shops, etc. The city has fine churches, schools, banks, libraries, a hospital, a home for the aged, a Y. M. C. A. building, opera-house and other civic institutions. Population, 18,000.

Street-Railways. See ELECTRIC RAILWAYS.

Strength of Mate'rials, the resistance which materials offer to changes in form, such as elongations, compression, bending and twisting. Such changes in form are called strains, and the force with which the material resists a strain is called a stress.

In the use of materials for a structure or a machine it is all-important to the designer to know how much strain a given force will produce, whether the material will recover from the strain when the straining-force is removed, and how great the strain can be before breaking takes place. A structure must be designed so as to withstand without permanent set the loads that it is to carry. In most cases it is equally important to determine what is the least amount of material which can be safely used under the given conditions. Experiments to determine these facts cannot be made on the completed structure, for, while tests of complete structures are important, they cannot reveal all that is necessary to know and, besides, would be an expensive way of determining safety-limits. But by analysis of the forces and loads the designer can, even in complex structures, as bridges and roofs, reduce the forces to comparatively simple straining actions in the individual parts, so that he can make his plans from the results of experiments on the materials used. Such experiments are called tests of strength of materials, and the machines for making the tests are called testing-machines. (See TESTING-MACHINES.) The behavior of materials under loads is that, under any load, there is a strain (elongation, compression, bending, twisting etc.), and there is developed at the same time a stress-resisting force which tends to restore the material to its original form. In 1676 Robert Hooke first stated his law that in elastic materials the stress is proportional to the strain, a law which is assumed to be strictly true for structural testing. The ratio between the stress and the strain is called the coefficient of elasticity. For practical purposes there are as many kinds of coefficients as there are kinds of strain, as coefficient of tension, of compression, of bending or of torsion. As long as Hooke's law holds, the material regains its original form as soon as the straining-force is removed. But if the strain goes beyond a certain amount, depending on the material, the material remains permanently deformed or set, and we say it has been strained beyond "the elastic limit." In engineering-work it is very important that no part of a structure or machine shall be strained beyond the elastic limit. If the load be still further increased, the material will break under the load, and we have the breaking-force or "ultimate strength of the material." From the above it is seen that the important tests which are commonly required are (1) amount of elongation, of compression, of bending and of torsion produced by different forces; (2) elastic limit in each case; and (3) the ultimate strength or breaking-force in each case. Stresses and straining-forces are, in British and American engineering practice, stated in pounds per square inch. We can thus express the average tensile strength of timber as 10,000, of cast iron as 20,000, of wrought iron as 60,000 and of steel as 100,000 or over, meaning so many pounds per square inch cross-section. The strength of any material depends not only on the composition of the material but on its physical condition, the treatment it has undergone, the way the load has been applied, and in every case a wide margin must be allowed between the possible loads as shown by the tests and the actual loads and for conditions which cannot be fully taken into account. The term "factor of safety" is used to express this relation between working loads and theoretically possible loads. Thus for a working tensile strain, one fifth of the ultimate strength may be used for good wrought iron or the "factor of safety" is five. Besides the tension, compression, bending and torsion tests, there are a number of other tests which are made on materials for special purposes, as tests on paving-bricks for hardness and durability, tests of cements and limes. For detailed information on the strength of materials and testing consult Unwin's *Materials of Construction* or Merriman's *Mechanics of Materials.*

Strikes. See LABOR, LABOR-ORGANIZATIONS and TRADE-UNIONS.

Strobilus (*strō-bī'lŭs*) (in plants), a name given to the cone-like cluster of sporophylls which is best displayed by equisetums, club-mosses and gymnosperms. In gymnosperms it often is called a flower, and it really stands for the flower in plants without floral leaves. It probably is the structure from which true flowers have been derived.

Strych'nine. See POISONS.

Stu'art or **Stew'art,** the name of a royal family of Scotland and England. The name is derived from the office of steward of Scotland, which was given to one of the family by David I, king of Scotland, and became hereditary in the family. The family is of Norman origin, the first ancestor in England receiving lands from Henry I. The marriage of Walter, the sixth steward of Scotland, in 1315 to Marjory, daughter of Robert Bruce, brought the crown of Scotland to the Stuarts. "It came with ane lass," said James V. Robert II, the son of Walter Stewart and Marjory Bruce, came to the throne in 1317 as the first of the Stuart kings. Between 1371 and 1714 14 Stuarts sat upon the Scottish, and six of these also on the English, throne. The last Stuart sovereign was Queen Anne. The house of Hanover, to which the present ruling family of England belongs, is connected with the Stuart family through Sophia, Electress of Hanover, who was the granddaughter of James I. See *The Royal House of Stuart* by Gibb and Skelton.

Stuart, Gilbert Charles, an American painter, was born at Narragansett, R. I., in 1755. He studied at Edinburgh, worked his

passage home, and began painting at Newport, R. I. He returned to London in 1775, where he suffered from poverty until befriended by Benjamin West. He gained a high rank as a portrait-painter, rivaling Reynolds and other English artists. In 1792 he returned to America, and painted the well-known portrait of Washington and those of Jefferson, Madison and John Adams. He died at Boston, July 27, 1828. See *Life* by Mason.

Stuart, James Ewell Brown, a noted Confederate cavalry-general, was born in Patrick County, Va., Feb. 6, 1833, and died from mortal wounds at Richmond, Va., May 12, 1864. His early career was spent as a mounted rifleman in Texas and Kansas, engaged in Indian warfare. When the Civil War broke out, he held a captaincy in the regular army, but resigned this to enter the Confederate service, in which he became the most distinguished of cavalry officers in the army of northern Virginia. He took part in the battles of Bull Run, Antietam and Fredericksburg, and conducted raids through the Shenandoah valley and into Pennsylvania. Being promoted to the rank of major-general, he was assigned to the command of the cavalry in Lee's army and did good service for the Confederacy in the battles of the Wilderness. He covered the retreat after the battle of Gettysburg, and was mortally wounded at the battle of Yellow Tavern against the forces under Gen. Philip H. Sheridan. See McClellan's *Life of Major-General J. E. B. Stuart.*

GEN. J. E. B. STUART

Stubbs, William, an English historian, was born at Knaresborough, June 21, 1825. He studied at Oxford, and became a clergyman, settling at Navestock, Essex, in 1850. In 1866 he was appointed professor of modern history at Oxford. He was made bishop of Chester in 1884, and changed to the see of Oxford in 1889. His writings are historical, and are marked by great learning and rare impartiality, and hold the highest rank in English history. He edited a large number of medieval histories and chronicles as *Chronicles of Edward I and Edward II.* His historical works include *Constitutional History of England, The Early Plantagenets,* in the Epochs of Modern History Series, and *Seventeen Lectures on the Study of History.* He died on April 22, 1901.

Study, How to. The importance of this problem is indicated in the fact that one's attitude toward study and toward school in general is greatly dependent on his method of study. If there be friction in the process, one dislikes study and school and drops out of the latter early. But if little friction is present, so that the work is agreeable, one is likely to be a student and become well-educated.

The problem is seen to be more serious still, when it is recalled that very young people study in such a way that they gradually lose their native energy to think and act independently. One can easily spend so much time collecting ideas of other people, that he finally has no ideas of his own. Indeed, this tendency is common. Thus in the very process of being educated the native self is undermined and weakened. The real object of study, on the other hand, is not merely to collect; a new mass of facts can only submerge and destroy individuality. But the object is to use facts and ideas merely as means of nourishment. They are the food by means of which mental and spiritual ability is developed, as meat and bread are the means by which the physical body is developed. A power of consumption of ideas, therefore, that insures good assimilation is of the highest importance to every young person.

What, then, are the precautions that should be taken to bring this about?

In the first place, something should be done to overcome the comparative helplessness characteristic of a large percentage of school-children, when they meet intellectual difficulties in their studies. The remedy for the evil is much greater initiative on the part of children during the recitation. So long as the recitation continues to be what it has usually been, *i.e.*, a period where the teacher entirely assumes the initiative and children are wholly followers, helplessness on the part of pupils must be expected. On the other hand, if children are to become independent in mental work, they must be left alone more of the time, or at least must *lead,* rather than follow, in the recitation of lessons. This means that many of the recitation periods — possibly the greater part of those in the elementary school — should be spent by pupils, not merely in reciting, but in mastering lessons in the teacher's presence and under the influence of her suggestion. In other words, many of these recitation-periods should rather be *study-periods,* in which pupils study aloud before their teacher, thus taking the lead in such work and revealing their method of procedure for correction. This presupposes the teacher's willingness and ability to keep still much of the time, not altogether an easy task, and also a change of aim for much of the school-work. Ordinarily that object is knowledge of the various studies; in such work as this suggested, however, it would be knowledge of how to study, a very difficult thing.

Teachers may be willing to practice silence in class and to accept development of initiative on the part of their pupils as a very prominent aim. But until the children themselves become clear in regard to the direction in which initiative is to be exercised, they are likely themselves to be provokingly silent. What, then, are the further principal factors in proper methods of study?

Both children and college students generally recognize two main factors in study — *i. e.*, memorizing and thinking. Which should come first is the next important question to be met. Custom says: Memorizing. "Fix the facts or thoughts in memory, then reflection upon them can follow at leisure" is the common thought. But there are always more duties in life than time allows us to perform, so that reflection is habitually postponed until it is omitted. In consequence, to the great majority of persons, studying signifies mainly the stultifying work of memorizing. Suppose now, this order were inverted, and young people were taught to undertake, first, whatever thinking was expected of them in each lesson. They would then at least make sure of the more interesting part. But, more than that, thinking thoughts through, in the various ways required in good study, is the very best method of memorizing them, and psychologists recommend this method even in the case of *verbatim, memoriter* work. Conscious effort to memorize would then be largely or wholly unnecessary, because the memorizing would become a by-product of thinking instead of a substitute for it. Here is a very important fact to be taught to young people about how to study. If it were applied, there would need to be less of dull drill in school; one reason for so much of it now is that there is so little thinking. Some drill might still be necessary, but by coming after most of the thinking, the motive for it would be made plainer and it would be less wearisome.

What kinds of thinking are to be expected is the next important question. The remaining principal factors in study might well be expected to be the principal factors involved in thinking.

First of all comes the selection of what is relatively most valuable. There always is a tendency for young people to regard ideas as all on the same plane of work, and many teachers encourage rather than overcome this tendency. It is encouraged by assigning lessons by pages, and then requiring practically everything to be reproduced in class. It is encouraged, also, by allowing facts to be reproduced in the order in which they have been presented in the text, since this method emphasizes again the importance of *everything*.

To combat this tendency it is well to require pupils or students to recite by topics or points rather than by pages; to take up first what they consider the most important thought in the lesson, even though it happen to come last in the work: to suggest marginal headings and even write them into the margin if they own books. By such means the habit of watching for the main issue or issues can be inculcated.

Directly connected with this should come training in the habit of overlooking or neglecting what is relatively unimportant. A pupil who has so good a memory that he reproduces practically everything in a lesson seldom deserves praise. Such a memory merely relieves him from the necessity of thinking enough to discriminate between what is especially valuable and that which is insignificant. Some clearness as to the meaning of *thoroughness* in study is here involved. So long as young people are brought up with the idea that thoroughness means attention to *everything*, recognition of relative values will be wanting. A pupil should be now and then condemned, therefore, for paying attention to what is not worth the time. You cannot teach emphasis of some parts without presupposing neglect of others, for the two are correlatives.

The outcome of good training in these two directions should be a habit of seizing quickly on the main ideas presented and of grouping the details bearing intimately upon them around the central thoughts. That would mean organization of thought, a most valuable factor in proper study. Not only should relative values thus always be very prominent in study, but the soundness, in final value, of ideas in life should also be considered. Many persons have a profound respect for print, and willingly try to hold as valuable whatever they find in a text. But from childhood good judgment in this direction should be developed, and such attempts should be a part of a teacher's work, who is endeavoring to instruct pupils in the art of study. How often are newspaper and magazine articles, as well as whole books, unworthy of perusal! Young people must be trained, therefore, not only to judge what is relatively most valuable among a lot of ideas and facts, but what is valuable for life or lacking in such worth. In other words, they must practice judging practical worth, must be made critical to this extent, and learn to believe in their right and ability in this direction. This is nothing more than saying that children and college-students should develop independent judgment or be made self-reliant and sensible.

Intimately related to this last factor of study is the need of finding the specific bearings or relation that a given topic has for daily life. It is very common for

students to store facts for distant, future use without reference to actual life at the present time. But that attitude is certainly wrong. Knowledge cannot be judged and digested till its relation to life is seen. The standard for passing judgment on values is found in life itself. Another way of expressing this thought is to say that the student should conceive specific purposes which the ideas he is studying along a given line are likely to further. This is by no means an easy task, but it is an important one. A person who habitually reads a book or magazine article without thought of any effect it may bring about either in topics for conversation or journeys that he may take hardly has the right method of study. This does not signify that one should never read for the "mere momentary tickle" or that he should always be strictly critical. But it does signify that the purpose of ideas is found in their expression and that, unless one develop the habit of teaching what he learns to the point of its contact with life at home, on the street and elsewhere, he is like the miser in hoarding wealth without reference to its use. It is the wrong habit of mind for the student. Thus he should not only *judge the value* of thought, but should form the habit of *using it*.

Still another factor of study is the work of supplementing an author's statement. Even the best of authors fail to put most of their ideas into print, or, as Ruskin puts it, all literature — like the story of the Prodigal Son — appears practically in the form of parables, requiring much supplementing in order to be properly pictured and interpreted. The words in a minister's text in comparison with those in his sermon are perhaps as one to a thousand. The statements in any text should bear a somewhat similar ratio to the thought that they suggest in the reader's mind. Accordingly, much time should be occupied by children in school in vizualizing in greater detail and reflecting upon the scenes in geography, history and other English. To this end, questions testing mainly memory are out of place; questions involving reflection should be common, if young people are to become reflective. Again the initiative, it should be remembered, should come from the children. A very common remark from the teacher, in the treatment of text, might well be: "Do we need to stop here in order to talk over any matter?" The children should even learn to call a halt themselves at fit places and to offer the supplemental thought without even a suggestion from the teacher

These are some of the more important factors in proper study, very briefly presented. Children in the elementary school should be acquainted with these in their application, as they should be taught the principles of arithmetic. The teacher should always bear in mind that the main part of proper study is *reflection;* is *thinking*, rather than memorizing. Some one has declared that the good reader spends at least as much time reflecting on what he reads as he does in the actual reading. That is a valuable suggestion. But if such a habit of study is to be brought about, the teacher must watch the character of her question. The vast majority of questions put by teachers to-day are out-and-out memory questions, *i. e.*, they tax memory primarily. In place of these must come thought-questions. Then when children are told to "think and think hard," as they very often are, there will be some prospect that they will understand wherein the thinking that is required of them consists. See ARITHMETIC (latter part of article). Consult the Report of the National Educational Association for 1906 and *Suggestions for Improvement of the Study-Period* by F. M. McMurry. F. M. McMURRY.

Sturgeon (*stûr'jŭn*), a large fish both of salt and of fresh water, having an elongated body and the skin provided with five rows of large, bony plates. There are about 20 species, all living in the northern hemisphere. The skeleton and skull are cartilage, and the bony plates, which are formed in the skin, cover the head. Between the larger plates are smaller ones. The snout is elongated, the mouth, upon the underside, is tube-like and without teeth. In front of it hang four barbels. Its food is plants and small fish, which are sucked

STURGEON

into the mouth. The common sturgeon is found on both sides of the Atlantic and ascends rivers to spawn. It reaches a length of eight to twelve feet on the Atlantic coast, and is larger in European seas. It ascends the Hudson to Albany, and its red flesh is jocularly called Albany beef. The shovel-nosed sturgeon and the lake-sturgeon are common in the great lakes and waters of the Mississippi valley. They do not

enter the sea. A sturgeon of the Pacific coast reaches a weight of 600 pounds, but the largest of all inhabit rivers flowing into the Caspian and Black Seas. They are known as *hurso*, and reach a length of 25 feet and a weight of nearly 3,000 pounds. The sturgeon's air-bladder is the principal source of isinglass and the roe of caviar.

Sturgeon Falls, Can., on Sturgeon River, Nipissing District, New Ontario, on the main line of the Canadian Pacific. The water-power at this point has been developed to 10,000 horse-power. The pulp and paper mills of the Imperial Paper-Mills Company are here. They employ 1,500 hands. The nickel-belt extends within a few miles of the town. A refining and reducing plant is being erected. Extensive saw-mills are here, and the fishing industry is important. Population 3,500.

Stuttgart (*stŏŏt'gärt*), a city of Germany, is the capital of Württemberg. It is about two miles from Neckar River and 127 southeast of Frankfort, and is surrounded by hills, which are covered with vineyards, gardens and beautiful houses. Near Palace Square, in the center of the city, are the old castle, belonging to the 16th century, the new palace, the theater, academy, the jubilee column (1841), a statue of Schiller and the railroad-station, which is one of the finest in Germany. There are a famous polytechnic school, a conservatory of music, a museum and art-gallery and the royal library of over 500,000 volumes, including a fine collection of 7,000 Bibles. Stuttgart has one of the largest book-trades in Germany, and manufactures beer, pianos, chemicals, chocolate and furniture. Its fairs for the sale of books, hops, cloth and horses are celebrated. It has been the capital of Württemberg since 1842. Population 285,589.

Stuyvesant (*stī've-sant*), **Peter,** the last Dutch governor of New York, was born in Holland in 1592. He was in the army in the West Indies, became governor of Curaçoa, and lost a leg in the attack on St. Martin. He was made director-general of the New Netherlands, as the country was then called, in 1646. He was conciliatory toward the Indians and just toward his subjects; but, when a convention demanded that "no new laws should be enacted but with the consent of the people," Stuyvesant commanded the separation of the assembly, saying: "We derive our authority from God and the Company, and not from a few ignorant subjects." In 1650 he helped to decide the boundaries between the Dutch and English possessions, and in 1655 took the region around the Delaware from the Swedish settlers. When the English war-ships in 1664 appeared before New Amsterdam (New York), he was obliged to yield to the will of the people and surrendered the city, the treaty being signed on Sept. 4, 1664, in Stuyvesant's house on his farm, known as the Great Bowerie, from which the Bowery in New York received its name. He lived 18 years after the surrender on his farm, where he died in August of 1672. See *History of New York* by Martha J. Lamb and *Knickerbocker's History of New York* by Washington Irving.

Style (in plants), that part of a carpe which rises from the ovary as a more or less elongated beak, and bears the stigma. It relates the stigma properly to pollination. It usually is a slender cylindrical body, but it often is much modified in form, as in the common iris or flag, in which it resembles a small petal. In case the style is lacking, the stigma is said to be sessile on the ovary. See FLOWER.

(*a*) Style.
(*b*) Stigma.

Stylites (*stī'lī'tēz*), **Simeon,** a member of a class of hermits who spent their lives on pillars (Greek *styletes*). He was the founder of the order, and lived in the beginning of the 5th century. He was a Syrian monk and spent nine years in a monastery without stirring from his cell. Then, in his desire for holiness, he ascended a pillar near Antioch, where he spent 30 years. The pillar was 72 feet high and only four feet square on the top. His fame brought crowds of pilgrims, to whom he preached, making many converts from paganism. He died on his pillar in 459, when 72 years old, and was buried with great pomp at Antioch. Other monks followed his example down to the 12th century.

Styx (*stĭks*), in Greek mythology, is one of the rivers of the lower world, around which it flows seven times. Charon ferries the souls of the dead over this stream. It is named from the nymph Styx, the daughter of Oceanus, who first came to the help of Zeus against the Titans.

Sub'marine' Nav'iga'tion. See TORPEDO.

Subsoil is the soil below the surface-material which has undergone chemical change by weathering (see SOILS) and may contain humus, making it darker than the subsoil. Subsoiling is deep plowing to bring up the lower soil that has not been exhausted by cropping. Its mineral food cannot become available until decomposed by weathering-agents (see NITROGEN-GATHERING CROPS). The weathering process goes on slowly, and land has been greatly injured by bringing up too much at once. Subsoiling should go on at the rate of about half an inch a year till a depth of nine or ten inches is reached.

Suchau (*sōō'chou'*), one of the largest cities in China, is 50 miles northwest of Shanghai, on the imperial canal. It is built on islands separated by canals. It is a center of silk-manufacture and print-

ing. It was captured in the Tai-ping rebellion, and retaken by "Chinese" Gordon in 1863, when many of its finest buildings were destroyed. Population 500,000.

Suck'er (in plants), a very strong-growing branch which arises in an unusual position, as from the older parts of trees and shrubs, often at the base, or in connection with wounds. The process known as pollarding is for the purpose of inducing the development of suckers by means of wounds. Suckers are often called watersprouts.

Sucker, the name given a number of freshwater fishes of North America, with thick, fleshy lips bordering a sucking mouth. There are about 60 species in the family, which embraces the buffalo-fishes of the Mississippi Valley, the common suckers and the mullet or red horse. They feed on plants and small water-animals. The common or white sucker reaches a length of 18 inches, and is very abundant in streams from Canada to Montana and Florida. They are eaten, but the flesh is rather tasteless and bony. The *remora* (*q. v.*), having a sucking-disk on the back of the head, is also sometimes called a sucker, and the name is also applied to the hag and certain other fishes.

Sucre (*sōō'krā*), a name for Chuquisaca, the capital of Bolivia (*q. v.*).

Sudan (*sōō-dān'*), a vast region in Africa, stretching from the Atlantic to the Red Sea and from Egypt and the Sahara almost to the equator. The Arabic name, *Beled-es-Sudan*, means Land of the Blacks. It is the home of the true negro race. Its area is estimated at 2,000,000 square miles, its population at 20,000,000. There are three divisions — eastern, western and central Sudan. Eastern Sudan is sometimes called the Egyptian Sudan, which until 1882 was a province, with Khartum for its capital. It is now divided into 13 provinces, which are subdivided into districts and include Bahr-el-Ghazal, Berber, Blue Nile, Khartum, Kordofan, Red Sea, Senaar, Upper Nile, White Nile and other provinces. (Darfur, though within Egyptian Sudan and paying tribute, has a hereditary sultan and manages its internal affairs almost independently.) The regions watered by the Nile are very fertile, yielding great crops of cotton, indigo, sugar, rice, corn and tobacco. Other parts are bare, though covered with grass in the rainy season, when they afford pasture to large flocks of camels, sheep and goats. Other products are ivory, ostrich-feathers, gums, india-rubber, iron, gold, honey and wax.

Egyptian Sudan covers 950,000 square miles, and has a population of about 2,000,000. The Egyptians for 60 years after 1819 extended their power over the regions around Khartum and even to the Wellé and to Lake Victoria, but in 1877 and 1882 the native tribes rebelled. General Gordon, sent out by the English government to the help of Egypt, was shut up in Khartum, and his mission ended in disaster. In 1896 the Anglo-Egyptian army again sought to recover the lost provinces, and after two years were successful. A convention between the British and Egyptian governments followed, in which it was agreed that they should govern Sudan jointly through a governor-general. Khartum is in railway and telegraphic communication with Cairo, and on Dec. 12, 1899, Sudan was declared open for general traffic. Western Sudan includes the valleys of the Niger, Senegal and other rivers draining into the Atlantic and the countries known as French Sudan. Central Sudan covers the valleys of the rivers that drain into Lake Tsad. Consult Schweinfurth's *Heart of Africa* and Nachtigal's *Sahara and Sudan.* See AFRICA, EGYPT, FRENCH SUDAN, NIGER RIVER, NIGERIA, NILE, SENEGAL, SOKOTO and TIMBUKTU.

Sue (*sū*), **Marie Joseph Eugene,** a French writer, was born at Paris, Dec. 10, 1804. He practiced surgery for some years in the army, in Spain and at Navarino, using his experience in his novels. *The Mysteries of Paris*, a famous novel, was his first success. It was printed in 1842, and appeared first in *The Journal of Debates. The Wandering Jew*, with which Sue's name is most associated, was also printed first in a newspaper, and issued afterward in ten volumes. He later wrote *Seven Capital Sins* and *Mysteries of the People.* The last work was condemned by the court at Paris as immoral and seditious. In 1850 he was elected a deputy to the assembly, but went into exile after the accession of Napoleon III and died in Savoy, Aug. 3, 1857.

Suez (*sōō-ez'*) **Canal,** a passage connecting the Mediterranean and Red Seas, was begun in April, 1859, under the French engineer, Lesseps (*q. v.*). Half the money for the great work was raised by subscription in Europe, and the other half by the khedive of Egypt. The canal was finished in 1869. It cost about $100,000,000, and is 87 miles long and originally from 150 to 300 feet wide at the top and 26 feet deep. In 1886 it was widened and deepened. The highest point cut through is not more than 50 feet above the ocean. Sidings, side-basins to allow vessels to pass each other, are built every five or six miles. Since 1887 the canal has been lighted by electric light. It costs a vessel about $500 to make the passage, and takes a little over 24 hours. In 1910, 4,533 vessels, exceeding 23 million gross tons, passed through the canal, and the number of passengers, military and civilian, was 394,253. Population of Suez, Port Said and Canal Environs 75,149.

Suf'frage is the right and act of voting either for the election of public officers or

upon such laws as may be submitted to the people. In most countries suffrage is restricted to males above the age of 21. Other requirements that are practically universal are citizenship and a certain term of residence in the state or electorate

in which one votes. In the United States the suffrage is granted and controlled by the states, and not by the Federal government. The consequence is a diversity of requirements for the suffrage. The idea that the suffrage is one of the natural rights of man would find its logical conclusion in universal adult suffrage, such as is enjoyed in New South Wales and New Zealand; or at least in universal manhood suffrage. In most of our own states (see WOMEN'S RIGHTS) the suffrage is restricted by the exclusion of women, criminals, idiots, illiterates and sometimes other classes. A property qualification is now seldom required. Previous to the Civil War most of the states had adult manhood suffrage, negroes excluded. By the fifteenth amendment to the constitution the states are forbidden to abridge suffrage "on account of race, color or previous condition of servitude." Other conditions have been imposed, however, by some of the states by which negroes in those states are for the most part now disfranchised. In North Carolina and Louisiana all whose fathers and grandfathers enjoyed the suffrage in 1867 may enjoy it without regard to other qualifications. Some of the southern states have used educational tests after the fashion of Massachusetts and Connecticut, chiefly in order to disfranchise the ignorant element among the negroes.

Suffren', Pierre Andre de, a French naval hero, was born at Saint-Cannat, July 17, 1726. He entered the navy when only 14, was captured but soon released, and served six years with the Knights of Malta. He was with the fleet blockading Gibraltar, and in command of five ships sailed to Madras, where he was in two or three battles, and conquered Trincomalee (1782). He was made vice-admiral of France on his return to Paris, where he was received with the greatest honors. He is called "one of the most dangerous enemies the English fleet has ever known, and, without exception, the most illustrious officer that has ever held command in the French navy." He died at Paris, Dec. 8, 1788. See *Studies in Naval History* by Laughton.

Sugar, the name of a great number of substances which have a certain chemical composition and are soluble in water. The sugar of commerce, however, is chiefly derived from sugar-cane and sugar-beet, the latter supplying nearly two thirds of the sugar used by the world. In these and other plants the sugar is an essential food, and is manufactured out of raw materials by green plants.

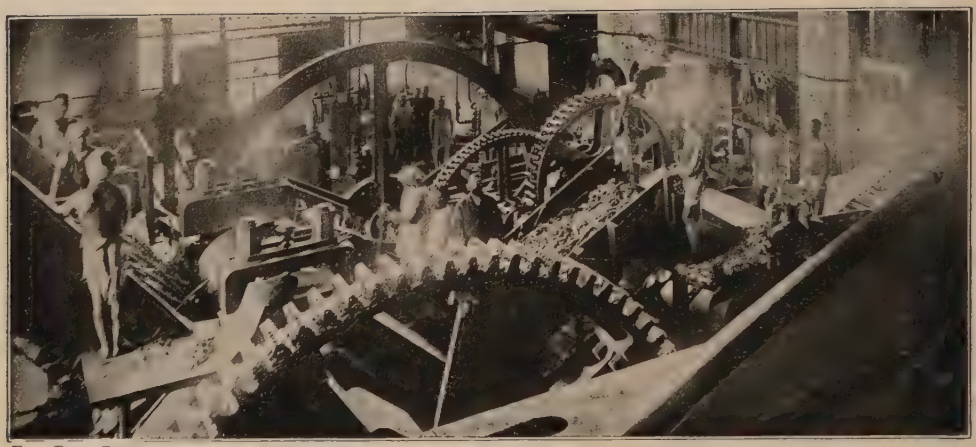
The sugar-cane (*Saccharum officinarium*) is thought to have originated in India, but it is not known wild. In the United States sugar-cane is most extensively cultivated in Louisiana, but it also is an important industry in Florida and Texas, and is cultivated to some extent in Mississippi, Alabama and Georgia. Cuba and Hawaii also are great centers of the sugar-cane industry. Sugar is extracted from cane by milling or by diffusion. The first method is more used, diffusion being confined almost wholly to sugar from beets. Mills handle from 200 to 1,400 tons of cane a day, and extract 90 to 95 per cent. of its sugar. The cane, cut or shredded before reaching the mill, is crushed, watered and crushed again. Watering the cane increased the quantity of sugar extracted by the second crushing, the increase being four or six pounds of sugar for each ton of cane. The sugar-juice extracted is next clarified and impurities removed. This is done by defecation, carbonation or superheating. Each process uses chemicals, as lime, sulphur or others; heat; settling; and filtering. Defecation consists in straining the juice through copper-wire gauze, drawing it into a tank, and, in case sulphur is used, mixing it thoroughly with sulphur dioxide. From the tank the juice is drawn into clarifiers of 2,000 to 6,000 gallons, where it is neutralized by milk of lime and heated almost to boiling. Some impurities rise, and others sink, but both are removed and the clear juice is drawn off and filtered. The liquid is then concentrated to such a density that the sugar crystallizes. This is accomplished in up-to-date factories by vacuum-appa-

From Brown Bros.

The sugar of the world is made chiefly from sugar cane and from sugar beets. This picture of a sugar cane field, with the figure of a man standing and of another on horseback, shows the height to which the cane grows, which is frequently more than twelve feet. In grows in tropical and semi-tropical countries and is grown from cuttings, as the plant rarely bears seed.

From Brown Bros.

About half of the world's sugar is now produced from sugar beets, and this industry has become a highly important one in the northern section of the United States, in Germany and other countries. We here see wagon loads of sugar beets being hauled to the railroad station for shipment to the sugar factory.



From Brown Bros.

Sugar cane is cut and shipped to a sugar mill. Here the cane is crushed by machinery, which we see in this picture, and is then placed between rollers which squeeze out the juice. The juice is first treated with milk of lime, to remove impurities which settle to the bottom of the tank, and the juice is then heated and evaporated, and raw or unrefined sugar is produced.

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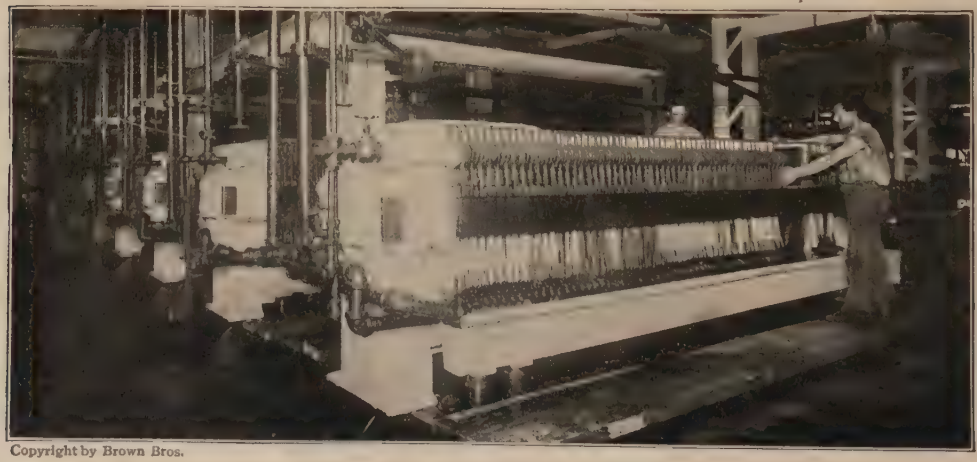
Raw sugar is here dumped through the grating into an elevator which carries it to the top of the building, where the work of refining sugar begins.



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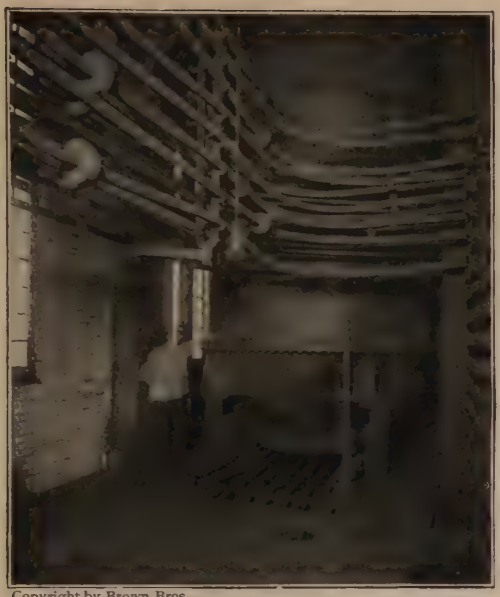
Here the raw sugar is first mixed with water and is then melted and passes through the filter presses which we see in this picture. Here the sugar liquor is filtered to remove particles of dirt or other matter.



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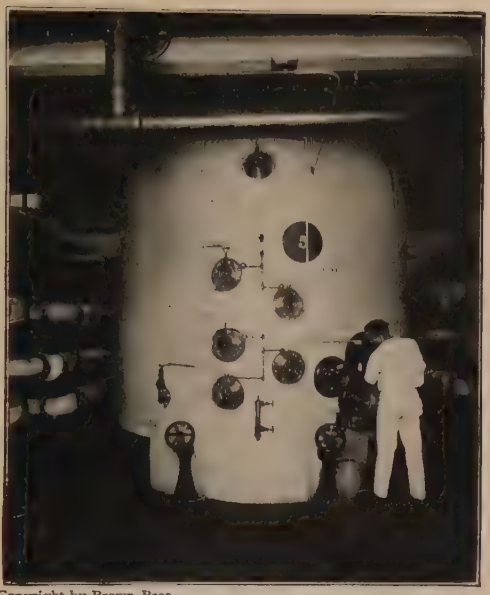
The sugar in liquid form is then passed through the filter of bone charcoal which we see in this picture. This removes all the coloring matter from the liquid, leaving it white and ready for producing white sugar.



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The syrup now passes into a machine called a vacuum pan which we see in this picture. Here it is boiled to remove the water, and this boiling must be very carefully done, to secure proper granulation and appearance of the finished product.

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When the syrup has been reduced to the point of granulation and is a half solid mass, it passes from the vacuum pan to the centrifugal machine which we see in this picture. Here by centrifugal or whirling action the sugar is separated from the syrup, with which it is mixed and becomes granulated sugar

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The sugar, which is still damp but otherwise finisned, then passes to granulators or dryers, which we see here. It is here kept constantly in motion in steam-heated drums, to remove all trace of moisture and, at the same time, keep it in a granular condition, free from lumps.

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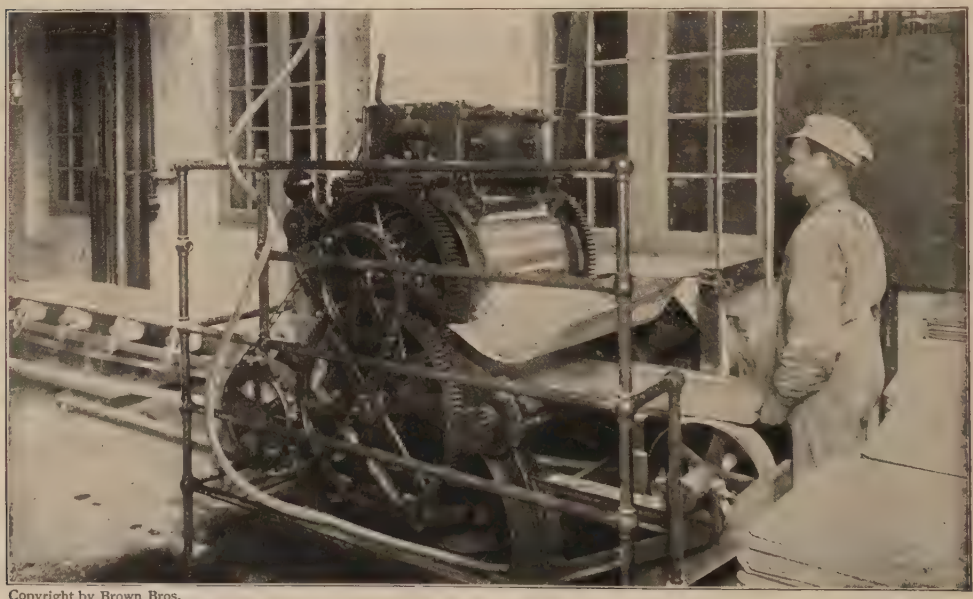
In this picture the finished granulated sugar is conveyed through tubes to the packing room and is packed in barrels, ready for shipment.



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This is a cube machine. Damp granulated sugar is here forced by pressure into small moulds on the outside of a cylinder. The cubes are later more thoroughly dried by steam in a drying room or oven, and then are packed for the market.

ratus, — a dome-shaped receptacle of five to ten feet diameter, eight to 15 feet height and provided with steam-coils. The juice passes through three of these pans, is concentrated by steam and boiled. When grains of sugar are found, crystallization has occurred, and the rest of the process consists in making these become whatever size is wanted. This object is gained by continuing the boiling *and inserting little amounts of syrup time and again.* Finally the mixed syrup and sugar are separated in a centrifugal machine revolving 1,000 or 1,200 times a minute, which throws the molasses out, whereas the sugar stays. This sugar is "first" or "raw" sugar.

In 1911 the world's production of cane-sugar was 8,522,000 (long) tons, the United States (including Hawaii, Porto Rico and the Philippines) producing 1,266,000 tons, Cuba 1,900,000 and Java 1,175,000. Mauritius, Brazil, Queensland, Peru, the British West Indies, Argentina, Demerara and Haiti and Santo Domingo also produced cane-sugar, Mauritius yielding 220,000 tons, but Haiti and Santo Domingo only 60,000. The consumption of cane-sugar in the United States in 1906 was 2,557,696 tons.

The sugar-beet (*Beta vulgaris*) came from Burgundy, and is extensively cultivated in Europe. In the United States the sugar-beet industry is comparatively recent, and is most largely developed in Colorado. Cultivating this beet is extremely expensive. Harvesting begins at different times in different sections, — in California as early as August, elsewhere as late as October, — and takes two or four months. The beets are washed and sliced, and then their sugar is extracted by washing them in cells filled with hot water. The liquid sugar-solution is purified by carbonation, that is, by applying lime and carbon dioxide, bleached with sulphur dioxide, and then settled and filtered. The filtered liquid is treated like cane-sugar. Germany preëminently is the home of the beet-sugar industry. In 1911 it produced 2,572,000 (long) tons; Russia 2,075,000; Austria 1,600,000; France 756,000; the United States only 510,000; Belgium 283,000; and Holland 181,000. Colorado produced 199,405 tons, California 127,272 and Michigan 106,053. The whole world's production of beet-sugar was 8,575,704 tons.

The sugar-trade of the world is regulated by international agreement (1902). The United States, which, with Cuba, can easily supply the American demand, have practically ceased to import sugar from Europe.

Maple-sugar is a sugar of minor commercial importance, the maple chiefly used being *A. saccharinum.* The principal centers of this industry are Vermont, New York and Ohio.

Su'liotes, a mixed race who inhabited the valley of the ancient Acheron in what now is European Turkey. They were of Greek and Albanian origin, and were descended from a number of families who fled from Turkish oppression to the mountains of Suli, whence their name. For several years they resisted the Turks, but, vanquished at last, took refuge in the Ionian islands. Though they helped in the war of Greek independence under their brave leader, Marco Bozzaris, their country was not included within Greek boundaries by the treaty of 1829 nor by the extension to that treaty of 1881, but most of them established themselves in that country. See *History of Suli and Parga,* by Perhaebos.

Sul'la, Lucius Cornelius, a Roman dictator, was born in 138 B. C. As quæstor in 107 under Marius in Africa, he induced the Mauritanian king to surrender Jugurtha, whom he brought in chains to the Roman camp. He was in the war against the Cimbri and in Cilicia, where he was sent by the senate to restore the king to his throne. On his return to Italy in 91 the rivalry between him and Marius threatened to break out openly, but was checked for a time by the Social War, in which Sulla won a brilliant success. He was given command in the second war against Mithradates, but Marius affected his expulsion from Rome, only to be in his turn driven out by Sulla. The four years he spent in the east were years of great success, in which he took Athens and won the victory of Chæronea. He crossed the Hellespont, forced Mithradates to ask for peace, landed at Brundusium and before the gates of Rome fought the great battle with the Samnites in which 50,000 men fell on each side. Sulla was now master of Rome and Italy. His dictatorship was marked by the cruel murder of his enemies. He published a list of proscribed persons whom any one might kill, and in this way got rid of his enemies, to the number of nearly three thousand. He made some changes in the government, mainly in strengthening the senate and taking the power from the people. He spent his last years at Puteoli in dissipation, bearing the marks of it in his blotched face, compared by the Greeks to a mulberry sprinkled with meal. He died in 78 B. C. The inscription on his monument, said to have been composed by himself, asserts that none of his friends ever did him a kindness, or none of his foes a wrong, without being well-repaid.

Sul'livan, Sir Arthur Seymour, an English composer, was born at London, May 13, 1842. He studied at Leipsic. He wrote *Kenilworth,* a cantata; the overtures *In Memoriam* and *Marmion* and the oratorios of *The Prodigal Son, Light of the World, Martyr of Antioch* and *The Golden Legend.* He is best known by his hymn-tunes (by *The Lost Chord* especially) and by

his songs and burlesque operas. The operas were written in connection with W. S. Gilbert and were very popular, especially *H. M. S. Pinafore*, which ran for 700 nights, and *The Mikado*. Later he wrote the opera of *Ivanhoe*. He received many honors, and in 1883 was knighted. He died on Nov. 22, 1900.

SIR ARTHUR SULLIVAN

Sulphur (*sŭl'fŭr*), one of the nonmetallic elements. It is found very widely distributed in the mineral knigdom, partly free, partly in combination with other elements. It is usually abundant in volcanic districts, large quantities coming from Sicily. It is found in many parts of the United States, but this cannot compete with that from Sicily. Free sulphur is found mixed with earthy matter or pure in the shape of crystals. In combination it is found with iron and copper as iron and copper pyrites; with lead in galena; with zinc in blende. It is also found in the form of sulphates, as the sulphates of lime and magnesia. In vegetables it exists in the proteids or albuminoids of seeds, in the oils of mustard, garlic and asafœtida and in the juices of some plants. In animals it is found in the tissues, hair, saliva etc. Sulphur is a solid, brittle, yellow substance, without taste or smell, and will not dissolve in water. When heated, it forms a thin yellow liquid; heated to boiling-point, it forms a yellow vapor. This vapor condenses into a fine powder, called flowers of sulphur. When it is melted, it is poured into molds, which make the common roll-sulphur or brimstone. When heated in the air it takes fire, burning with a blue flame, and changes into sulphurous acid with suffocating fumes. Sulphur is used in making matches and gunpowder and, as sulphurous acid, in bleaching, in the destruction of insects and the germs of disease and in the manufacture of sulphuric acid or oil of vitriol, which is a compound of sulphur, oxygen and hydrogen. Large quantities of the acid are used in preparing sodium sulphate from common salt as a preliminary step in one of the processes for making soda.

Sulu (*sōō-lōō'*) **Islands, Philippine Group,** acquired by the United States from Spain by the terms of treaty of peace, Dec. 10, 1898. The Sulu archipelago extends from the southwestern peninsula of Mindanao Island to the northeastern angle of Borneo and between the Sulu and Celebes Seas, the latter an eastern inlet of the Pacific. The larger islands are mountainous and of volcanic origin; the smaller ones are chiefly coral islets, covered with verdure. There are five chief islands, the dominant race being the Moros, speaking the Sulu tongue, which is akin to that of the Malays. The inhabitants are hardly civilized yet, and consequently piracy was common among them even under Spanish rule. The staple growths include corn, rice, coffee, chocolate, sesame, saffron, cotton and hemp. The Chinese formerly did considerable barter with the islands, exchanging opium, tobacco and general merchandise for pearl-shell, coral, sharks' fins and native cordage. Estimated population 51,400, of whom less than 1,300 were civilized in 1903.

Su'mac, species of the genus *Rhus*, which contains over 100 species, chiefly tropical. In the United States there are about ten species, some of them well-known shrubs or small trees, with leaves which show bright red to purple coloration in autumn. The common poison-oak or poison-ivy (*R. Toxicodendron*) is a sumac whose foliage is very poisonous. The most common form is *R. glabra* or smooth sumac, a shrub which often covers large and especially barren areas, with large compound leaves and dense, crimson, velvety clusters of fruit. See POISONOUS PLANTS.

Suma'tra (*sōō-mä'trä*), one of the largest islands of the Indian Archipelago, lies on the equator. It is 1,115 miles long and 275 broad, and is a dependency of the Netherlands. The Chain Mountains in several ranges, from 7,000 to 10,000 feet high, cross the island, with seven or eight active volcanoes and a number of mountain lakes. There are large rivers on the western side of the island, and the forests are so thick that it is said an ape can travel across the island from tree to tree without once descending to the ground. A Dutch expedition in 1877, exploring only a small part of the western side, collected 400 varieties of timber. The animals of the eastern side differ entirely from those on the western side. The orang-outang (*q. v.*) and the bru are the most common apes. The bru is employed by the natives to gather their cocoanuts. The tiger, Malay bear, hog, two-horned Sumatran rhinoceros and elephant are among the best-known animals. The python, 15 to 20 feet long, cobra and crocodile are found; and 250 species of spiders have been discovered since 1858. Gold and coal are mined; rice, sugar, coffee, pepper, cocoanut, sago, corn and sweet potatoes are cultivated. The people are of different tribes of the Malay family. The island became known in 1508 to Europeans through a Portuguese explorer, and Portuguese trading-stations were formed on the coasts. The Dutch drove out the Portu-

guese, but did not completely occupy the coast until 1881, and large parts of the interior are still unexplored. The area is 161,612 square miles, with a population of 4,029,000. In 1832 what is known as the culture-system originated in Java and spread to the western coast of Sumatra. This meant the officially superintended work of the natives in the culture of various products; but in 1870 this system was abolished, and native labor is now required only for the production of coffee. The Europeans and those connected with them live under the laws of the mother-country, while there are separate laws for the natives. Schools are provided for Europeans, natives and orientals. Consult Alfred Russell Wallace's *Indian Archipelago*.

Sum'ner, Charles, an American statesman, was born at Boston, Mass., Jan. 6,

CHARLES SUMNER

1811. He studied at Harvard and adopted the profession of law. He edited *The American Jurist* and three volumes of law-decisions, chiefly those of Judge Story, and lectured in the law-school at Harvard. He carried his law-studies farther in Europe at the Sorbonne, and spent two or three years in travel, receiving marked attention when in England. His appearance in politics dates from July 4, 1845, when he delivered his oration on *The True Grandeur of Nations*, which denounced the use of war to decide national questions and attracted general attention both in America and Europe. He succeeded Daniel Webster in the senate of the United States in 1850, and retained his position through successive re-elections until his death. He helped to form the Free Soil party, and stood almost alone in the senate at that time in his opposition to slavery. His strong, uncompromising attacks upon slavery were bitterly resented by the south. This hostile feeling resulted in an attack upon Sumner while sitting at his desk in the senate-chamber, from the effects of which he suffered for nearly four years. His speech on *The Barbarism of Slavery*, delivered in June, 1860, was occasioned by the struggle over the admission of Kansas as a free state. As chairman of the committee on foreign relations, in March, 1861, he argued against the seizure of the Confederate commissioners in the Trent affair, and made a powerful speech on *Our Foreign Relations* and one on *Our Claims against England*. He was selected in April, 1865, to deliver the eulogy on Lincoln. His opposition to the treaty with Santo Domingo in 1869, brought him into difficulty with President Grant, and ended in his supporting Greeley for the presidency in 1872. Among his last important measures were the introducing of the civil-rights bill and of the resolution to remove the names of battles of the Civil War from the colors of the army. His publications are made up of his public addresses, and fill 15 volumes, prepared for the press partly by himself and partly by Longfellow, his literary executor. Consult *Memoirs and Letters* by Pierce and *Life* by Lester. He died at Washington, D. C., March 11, 1874.

Sumner, Edward Vose (1797–1863), American soldier, was born in Boston, Mass., and educated at Milton Academy. In 1819 he entered the army as second lieutenant, and served in the Black Hawk and Mexican Wars and took part on the frontier in campaigns against the Indians. In the early 50's he was governor of New Mexico, and later saw further Indian fighting, chiefly against the Cheyennes. In the Civil War he was given charge of the Department of the Pacific, with the rank of brigadier-general, but was subsequently transferred to the Army of the Potomac, where he served during the Peninsula and Antietam campaigns and saw severe fighting at Fair Oaks and Fredericksburg. For these services he was promoted to be major-general both in the volunteer and the regular army. Late in 1862 he was assigned to command in the Department of Missouri, but died (at Syracuse, N. Y.) ere he could reach the field of his new duties.

Sum'ter, Thomas (1734–1832), an American Revolutionary soldier, was born in Virginia. Early in his career he served under Braddock in the disastrous expedition against Fort Duquesne and took part in fighting the Cherokees. In 1776 he was appointed lieutenant-colonel of a regiment of South Carolina riflemen, and subsequently became a partisan commander, defeating the Tories in 1780 at Hanging Rock. Twice he had to accept defeat at the hands of Tarleton, the English general in command of *The British Legion*, though later he settled accounts with that general at Blackstock Hill, though himself wounded in the affair. Prior to this, and while in

command of the South Carolina troops, he had gained the rank of brigadier-general. At the close of the Revolutionary War he acted as a member of the South Carolina convention which ratified the Federal constitution, and for two periods (1789–93 and 1797–1801) was a member of the Federal house of representatives. During 1801–09 he served in the national senate, and during 1809–11 he was minister to Brazil. When he died, he was the last general officer of the Revolutionary era.

Sun, The, our nearest star and the central body of the solar system. For the inhabitants of the earth no other body in the heavens compares for an instant with the sun in interest and vital importance. For not only are the orbits of the earth and the other planets determined by the sun, but all forms of life on the earth immediately depend upon heat and light from the sun.

The distance of the sun from the earth is 92,897,000 miles, a stretch which baffles the imagination. Professor Young illustrates this quantity by saying that if a child were provided with an arm long enough to reach the sun and thus burn his hand, he would die of old age before he learned that he was burnt, assuming, as Helmholtz found, that sensations travel along the nerves at the rate of about 40 feet per second. Even light itself, traveling with the stupendous speed of 186,000 miles per second, requires 499 seconds for the trip from the sun to the earth.

The diameter of the sun is approximately 866,500 miles, a distance nearly twice as great as the diameter of the moon's orbit, while the mass is 1,332,000 times that of the earth, making its density about 1¼ times that of water and the attraction of gravitation at the surface of the sun 27 times as great as at the surface of the earth. The weight of an ordinary man at the solar surface would, therefore, be such that he could not stand erect with his present strength of muscles.

The period of rotation of the sun was first determined after Galileo had discovered spots on the solar surface; and this rotation takes place in a very remarkable manner, for Carrington found that at the sun's equator spots travel once around the sun in 25 days, while at latitude 30° the period is 26½ days, and at latitude 40° is no less than 27 days. Hence the sun rotates most rapidly near the equator and diminishes constantly in angular speed as one approaches the poles. This fact has never been satisfactorily explained.

As to the constitution of the sun and as to the nature of sun-spots there are almost as many "theories" as there are men. What is reasonably certain, however, is that practically all of the elements which have been found in the earth's crust are to be found in the sun, making it highly probable that at some time the earth split off from the sun in the manner suggested by the nebular hypothesis. Concerning the interior of the sun practically nothing is known; for its temperature is outside the range of our experiments.

The white surface of the central body of the sun is called the *photosphere.* The spectroscope shows that this photosphere is surrounded by a layer of incandescent gases which we call the *chromosphere.* Certain parts of this chromosphere appear at times to be heaped up into brilliant clouds thousands and even hundreds of thousands of miles high; these are called *prominences.* Beyond the prominences and the chromosphere is a halo of light seen only at times of eclipse. It is called the *corona;* but beyond the mere fact that it is an appendage of the sun little is known about it. The fact, however, that its spectrum contains bright lines would seem to indicate that it consists partly, at least, of a self-luminous gas.

The best account of solar phenomena is to be found in Professor Young's delightful volume, *The Sun,* published in the International Scientific Series. See ASTRONOMY and PLANETS.

Sun'bury, Penn., a borough, county-seat of Northumberland County, on Susquehanna River about 55 miles from Harrisburg. It is in a coal and lumbering region, and makes extensive coal-shipments. Its important manufacturing establishments are sash, door and nail factories, coffin and casket works, a rolling and a planing mill, silk-mills, dye-works and railroad-shops. Among its noteworthy buildings are Mary M. Packer Hospital, the county court-house and municipal buildings. East Sunbury is just across a small stream. Though the towns have separate municipal governments, they are united in their industrial interests. Sunbury was settled in 1772 and incorporated in 1797. It has the service of the Pennsylvania and Reading railways. Population 13,770.

Sun'day-Schools are schools for religious instruction, meeting on Sunday. There were schools for religious instruction in connection with the Jewish synagogues and also among the early Christians. Luther established such schools in Germany, and Knox in Scotland. But the credit of founding the modern system of Sunday-schools belongs to Robert Raikes, who in 1780, when living in Gloucester, England, gathered the children from the streets on Sunday and hired teachers for them at 25 cents a day. These schools opened at 8 A. M., lasted until the children went to church, and after the second service began again, holding until 5:30 P. M. The children were taught their letters, reading and the church-catechism. The first Sunday-school in

London was started by Rowland Hill in 1784. There are now, it is estimated, 7,000,000 scholars in the Sunday-schools of Great Britain. The first regular Sunday-school in America is thought to be the one started by Bishop Asbury in Hanover, Va., in 1786, though there had been schools for instruction on Sunday at Roxbury and Plymouth, Mass., as early as 1674 and 1680.

In 1890 the number of teachers engaged in Sunday-school work was estimated to be nearly 2,000,000, with almost 18,000,000 pupils, including all denominations.

The instruction is usually given by voluntary and unpaid teachers, a plan first adopted by the Methodists in England. The classes usually meet in the auditorium of the church represented and in any other available space in the church-building. It has been the custom for many years, also, to use a uniform series of Bible-lessons.

Quite recently the need for radical reform in the conduct of Sunday-schools has become apparent to many. These schools, as a class, in the quality of their discipline, instruction and equipment are recognized as far inferior to the day-school. Yet religious instruction should be as well-given as arithmetic or geography, any one will admit. To bring about improvement the first requisite is a well-ventilated, properly heated and lighted room for each class, as in any good school. To this end individual churches are beginning to erect separate Sunday-school buildings, with one assembly-room and many recitation-rooms.

Next, only trained teachers are desired, who have had time, energy and interest enough to prepare themselves carefully for each Sunday's instruction. To secure these, some churches are now paying these teachers a certain sum, as in the day-school. It is a great advantage for the superintendent of a Sunday-school to bear such a business relation to his teachers. He then has some means of influencing them to improve their work, when necessary, and to attend regularly. Beyond question very many persons have been giving instruction in religion who would not be considered for a moment as fit to teach any class in our public schools. Such a condition is bound to inculcate disrespect, on the part of many, for religion in general. Deep religious interest is essential to any Sunday-school teacher's success. But in addition to such interest there should be knowledge of the Bible and knowledge of good methods of instruction. It is to be hoped that the Sunday-school will improve during the next 25 years as much as the day-school has in the last 25.

Dr. Richard Morse Hodge of Union Theological Seminary, New York City, has been an active agent in bringing about improvement in the work of the Sunday-school.

Sun'derland, a seaport of Durham, England, is at the mouth of Wear River, 13 miles northeast of the city of Durham. Among the public buildings are the town-hall, free library, museum, art-gallery, winter-garden and Victoria Hall, the scene of a terrible accident in 1883, in which 182 children were killed. There are over 70 churches, an infirmary, an orphan-asylum and several theaters and clubs. People's Park contains a monument of Havelock. There are two iron-bridges over the Wear, the older one built in 1793–6 and widened by Robert Stephenson in 1858–9. There are four large docks and five piers at the harbor. Coal and coke, bottles and glass, earthenware and lime are exported. Sunderland is noted for its 13 iron shipbuilding yards. Iron, glass, chemicals, rope, paper and lime are also manufactured. The famous Pemberton coal-pit is 380 fathoms deep, and some of the workings reach under the sea. Sunderland is known to have been a town as early as 1311. It was a small place till the beginning of the 19th century, but since then, owing to the improvement of its harbor and the growth of Durham's coal-trade, it has grown fast. Population 151,162.

Sun'fish, a common name used to designate a number of different fishes. The fresh-water sunfishes, of which there are about 25 species, abound in the Mississippi valley. They are bass-like fishes. The most common one is generally known as the pumpkin-seed. It reaches a length of eight inches and is of bright colors — greenish olive, with bluish sides spotted with orange, and the belly and lower fins orange-tinted. It is very abundant in ponds, lakes and streams of the east. In western rivers sunfishes rarely come south of the latitude of Chicago. The marine sunfish or head-fish belongs to an entirely different family. There are three species inhabiting the open sea. They are large fishes, with a very short body, and look like huge fish-heads provided with fins. They reach a weight of seven or eight hundred pounds and a length of seven or eight feet. They are not good for food, but a healing oil is derived from their livers. Their habit of basking in the sun at the surface of the water gives them their name, while that of fresh-water sunfishes is derived from their bright colors.

Sun'flower, species of *Helianthus*, a genus of the great composite family. There are many species native to the United States, but the best-known form is *H. annuus*, a common species in cultivation, distinguished by its great stature and very large heads. It is a native of the western plains. The

seeds yield a drying-oil nearly equal to that of linseed.

Supe'rior, Wis., county-seat of Douglas County, is at the head of Lake Superior, on St. Louis, Superior and Allouez Bays. It is a terminus of the Great Northern; Northern Pacific; Chicago, St. Paul, Minneapolis and Omaha; the Duluth, South Shore and Atlantic, Minneapolis, St. Paul & S. Ste. Marie (Canadian Pacific), and Canadian Northern Railways. The city has a harbor line of about 30 miles, with extensive ore, coal, grain, lumber and merchandise docks, and its lake-commerce exceeds that of any city in the world with the exception of New York and Antwerp. Superior has a perfectly land-locked harbor, and is the natural outlet for all the country west of Lake Superior as far as the Pacific. Here is the largest dry dock on the Lakes, a steel plant costing $25,000,000 and the great shipbuilding plant that originated the whaleback. It is the distributing point of the northwest for coal and oil. There are 60 churches, a state normal school, 12 large public schools with over 6,000 pupils, two high schools, two business colleges, three parochial schools, two hospitals, a $50,000 Carnegie library, two daily and six weekly newspapers, seven banks, sixty miles of paved streets, complete sewerage system, electric light and gas plants, an excellent system of water-works, eight parks, and twenty-three miles of electric street-railway; manufactures chiefly flour, lumber, iron, furniture, barrels, briquettes, plaster, linseed oil. The climate is crisp, dry and beautiful, cool in summer and relatively mild in winter. The original settlement was made at the eastern end of the city in 1853, but from 1858 to 1882 the place was practically dead. In 1882 an attempt to build a city was made four miles east on St. Louis Bay, which proved so successful that the two settlements united in 1891 and incorporated as Superior. The growth has been very rapid, the last census showing a gain of 30 per cent. Superior is the second city in Wisconsin, having a population of 40,384.

Superior and Duluth (*q. v.*), like Omaha and Council Bluffs, are "twin cities," although located in different states. They are connected by bridges.

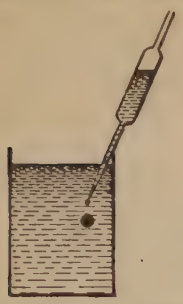
Superior, Lake, the largest body of fresh water on the globe, is the highest and most western of the great lakes. It is bordered by Michigan, Wisconsin and Minnesota in the United States and Ontario in Canada. Its greatest length is 412 miles, its greatest breadth 167; and it covers 31,200 square miles, making it a little larger than South Carolina. The surface is 601 $\frac{8}{10}$ feet above sea-level, and its mean depth is about 475 feet, its greatest depth being 1,008 feet, — 406 feet below the sea. Its surface is 20$\frac{1}{2}$ feet higher than that of Lakes Huron and Michigan, due to the fall at the rapids of St. Mary's River, the only outlet, where the average discharge is 86,000 cubic feet per second. Lake Superior is very near the watershed between Hudson Bay and the Mississippi, and so receives no large rivers, the largest being the St. Louis and the Nipigon. These rivers, with hundreds of small streams, drain 82,000 square miles into the lake. The largest island is Isle Royale, 44 miles long. Keweenaw Point reaches far into the lake. At Grand Isle Bay, about 100 miles west of Sault Ste. Marie, are the pictured rocks, sandstone cliffs from 50 to 200 feet high in many places, of fantastic shape and marked by bands and blotches of red and yellow. The boundary between the United States and Canada is drawn through the center of the lake from its outlet to the mouth of Pigeon River, but includes Isle Royale in the United States. Consult Crossman's *Chart of the Great Lakes.* See ERIE, HURON, MICHIGAN, ONTARIO and ST. CLAIR LAKES; DETROIT, NIAGARA, ST. CLAIR, ST. LAWRENCE and ST. MARY RIVERS; and SAULT STE. MARIE and WELLAND CANALS.

Surabaya (*sōō'rà-bä'yà*), a seaport on the northern coast of Java and on the Strait of Madura. Here the Dutch have a marine arsenal, a cannon-foundry and a mint. There also are machine, sugar and furniture factories. Population 146,944, of whom 8,906 are Europeans and 13,035 Chinese.

Surakarta (*sōō'rà-kär'tà*), a city in the center of Java, but joined by rail with Samarang on the north and Surabaya on the east. It is the home of the native sultan of Surakarta, who is a dependent of the Dutch government. Population 12,000. See JAVA.

Surat (*sōō-rät'*), a city of India, on Tapti River, 160 miles north of Bombay. It stretches for more than a mile along the river in the form of a bow, and is surrounded by suburbs in the midst of gardens. There are four fine Mohammedan mosques, two Parsi fire-temples, three Hindu temples, a clock-tower 80 feet high and the old citadel. Surat was founded in the 16th century, and was three times burned by the Portuguese. After the building of a strong fort in 1546, Surat became one of the greatest trading-cities in India, the English and Dutch as well as the Portuguese establishing themselves there. By the beginning of the 17th century Surat traded with western Europe, India, Arabia, Persia, Ceylon and the East Indies. Here, too, the Mohammedan pilgrims embarked for Mecca. In the 19th century it was pillaged several times by the Mahrattas, lost most of its trade to Bombay, its new rival, and in 1800 came into the hands of the British. It later regained some of its trade and became the largest city in India, but was ruined by a fire, followed by a great flood, in 1837. Surat exported large quantities of cotton during the American Civil War. Population 119,306.

Sur'face-Ten'sion is a phenomenon exhibited when two liquids (or a liquid and a fluid) which do not mix are brought into contact. For instance, a drop of oil placed in a mixture of water and alcohol, which has the same density as the oil, will neither sink nor rise; but it will gather itself into a sphere, *i. e.*, will assume a shape in which it has the least possible surface. In other words, it acts as if it were covered with a thin elastic skin which was continually tending to contract to the least possible area.



A DROP OF OIL FREED FROM GRAVITY

Another illustration of this phenomenon is seen when mercury is placed, in air, on glass, as indicated in the figure. The mercury does not flatten and run over the glass as it would do if gravitation alone were acting upon it; but it gathers itself into a more or less spherical shape. This globule is exactly what we should expect if the mercury were covered with a thin elastic membrane tending, all the while, to contract into the smallest possible area. This tendency of liquid surfaces to become a minimum is known as *surface-tension*. There is no skin or membrane over the surface of liquids; but the particles lying on the surface and very near the surface are in a different physical condition from the particles in the interior of the liquid; hence results this surface-effect, the details of whose explanation would lead us too far. The numerical value of the surface-tension of any liquid is *the force per centimeter which a single surface exerts* across any line drawn upon it. The unit in which surface-tension is measured, therefore, is *dynes per centimeter*. Consult C. V. Boys' *Soap-Bubbles and the Forces which Mold Them*, the finest elementary and popular treatment in the English language.

MERCURY ON GLASS

Sur'rey, Henry Howard, Earl of, an early English poet, was born between 1516 and 1518, probably in Suffolk, and was the son of the duke of Norfolk. In 1532 he accompanied Henry VIII to France, and spent a year in study at Paris with Henry's son, the duke of Richmond, who was betrothed to his only sister. In 1524 he was sent to Fleet Prison for challenging a gentleman to a duel, and next year suffered another imprisonment for breaking windows in the streets at night. In 1544 Surrey went to France as marshal of the invading army, and distinguished himself at the siege of Montreuil, where he was badly wounded. But next year he was defeated by a larger French force, and was superseded by the earl of Hertford. For his bitter speeches against Hertford he was imprisoned, and later, with his father, sent to the Tower, charged with high treason. His only offense was in having added to his own arms those of his ancestor, Edward the Confessor. In vain did he ably defend himself at his trial; he was found guilty and was beheaded on Jan. 21, 1547. His poems were published after his death, with those of Wyatt. They are sonnets, lyrics, elegies, paraphrases of *Psalms* and *Ecclesiastes* and translations. He was the first English sonneteer and one of the best. Consult Morley's *English Literature*. See SONNET.

Surveying (*sûr-vā'ing*), a branch of applied mathematics devoted to measuring land. There are two great branches: plane-surveying and geodesy. Plane-surveying is used where so small areas are measured that the surface of the earth can be looked on as plane. Where large areas are measured, as states and countries, the curvature of the earth must be taken into account and the science of land-measurement becomes geodesy. Plane-surveying is divided into such branches as land-surveying, having to do with fixing property-lines and areas of tracts of land; topographical surveying, having to do with levels and general contours of the landscape; hydrographical surveying, having to do with areas and depths of rivers, lakes and other bodies of water; mining surveying, having to do with the direction and lengths of mining shafts and galleries; railroad surveying; etc. One of the most important geodetic surveys now going on is the American coast-survey. It was started in 1832 by F. R. Hassler, and has now covered nearly the whole coast of the United States, the results being embodied in a sectional map on a scale of one mile to the inch. Eventually the whole country will be mapped out on this scale. Surveying and geodesy are applications of geometry and trigonometry, and involve the measurement of the length and directions of lines. All plane-surveying could be done by the measurement of lengths, but it is most convenient to measure angles also. The chief instruments are the chain or tape, compass, level and theodolite. In geodetic surveying instruments for measuring latitude and longitude must also be used.

The survey of public lands of the United States is in charge of a surveyor-general. The land is divided into townships, each six miles square. The townships between two meridians six miles apart make a range. The townships are then divided into sections a mile square, these containing 640 acres. Land-titles in the western states mostly refer to the original United States survey, and in this respect differ from the land-titles in the older states, where boun-

daries and corners are fixed by various natural and artificial marks. See HOMESTEAD-LAWS and PREEMPTION.

Susa (*sōō'sȧ*), a city of Persia, the Shushan of *Daniel* and *Esther*, the modern Sus and one of the most important cities of the Old World. Its name and ground-plan are traced on Assyrian monuments of the reign of Asur-banipal about 600 B. C. At the time of Daniel's vision "at Shushan in the palace" it belonged to Babylon, but it was brought by Cyrus under Persian rule, and the later kings made it the capital and winter residence of the Persian empire, building a strong citadel and a treasure-house. Alexander is said to have found vast treasures here, and, though Babylon soon became the chief city, Susa still was very rich when it fell into the hands of Antigonus (315 B. C.). Later, its fortifications were destroyed by the Arabs. Its ruins, among them the palace described in *Esther*, cover about three square miles.

Suspen'sor (in plants), an organ of the embryo, by means of which it is placed in proper relation to its food-supply. It is mostly restricted to the embryos of seed-plants, and is usually a more or less filamentous structure, at the end of which the embryo proper develops. See EMBRYO.

Sus'quehan'na River is formed by two branches. The north branch, 350 miles long, rises in Schuyler Lake in central New York; the west branch, 250 miles long, in the Alleghany Mountains. The two unite at Northumberland, Pa., and the river flows south to Harrisburg, southeast into Maryland and, after a further course of 150 miles, into the northern end of Chesapeake Bay. It is a shallow stream, much broken by rapids. In the spring immense quantities of lumber are floated down. Canals have been dug along its banks for 125 miles along the northern branch, and for 124 miles along the western branch. Its lower course is noted for ducks and other wild-fowl. Its chief branch is the Juniata. The Susquehanna is also noted for its wild and picturesque scenery.

Suttee (*sŭt-tē'*), meaning a virtuous wife, a once common usage of India, in accordance with which, on the death of her husband, the faithful widow burned herself on the funeral-pyre with her husband's body, or, if he died at a distance, was burned on a pyre of her own. The custom was practiced in India as early as the time of Alexander the Great, and was grounded by the Hindus on sacred books and laws of theirs. But no countenance to this barbarous rite can be found in the oldest and most sacred Brahman books. Nevertheless suttee, though not enforced on an unwilling victim and not practiced except in certain castes and families of old descent, was made almost necessary for well-born widows by the force of public opinion, unless they were willing to risk their own happiness here and hereafter. The rite came from a belief, common to many savage races, that it was well to send wives, slaves, horses, favorite weapons etc. with great men into the other world, by burying them with them, burning them or slaying them at their tomb. In 1823 about 900 widows were burned in India. In 1829, through the efforts of Lord William Bentinck, any encouragement of suttee was made murder. The custom is now rarely practiced.

Swabia (*swā'bĭ-ȧ*), a southwestern German duchy, stretching from Franconia to Helvetia and from Burgundy and Lorraine to Bavaria. It was so named from the Germanic Suevi, who drove out the Celts of this region in the 1st century B. C. The Alemanni became a part of the Suevic nation in the 5th century, and from this time there were dukes of Swabia. Under the Hohenstaufen emperors, who were Swabians, this duchy became the richest, most powerful and most civilized country in Germany. But when the Swabian line died, Swabia became the scene of feudal wars, and this unhappy state of affairs lasted for centuries. Swabia suffered terribly in the Peasants' War of 1525, in the Thirty Years' War (1618–48) and in the wars of the French Revolution. From the time of the Reformation the rulers of Württemberg (*q. v.*) struggled with the Holy Roman emperors for the control of Swabia. This struggle ended in the founding, in 1806, of the kingdom of Württemberg, which includes most of the old duchy. The name now denotes the south-central part of Württemberg, the adjoining part of Baden and the southwestern part of Bavaria.

Swal'lows, insect-eating birds with long pointed wings, noteworthy for rapidity of flight. Blanchan speaks of the swallow as "the typical bird of the air, as an oriole is of the trees and a sparrow of the ground." There are about one hundred species in all parts of the world. Six are common in the United States. All devour an immense number of insects and are beneficial to the farmer. The common barn-swallow is widely distributed and abundant. It is a little larger than the English sparrow, has a wide wing-spread, above is of a glistening steel-blue shading into black, underneath a warm chestnut-brown and shining buff, tail

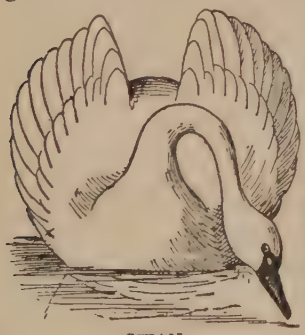
SWALLOW

noticeably slender and deeply forked. The nest is built sometimes outside, sometimes inside, a barn or other building, is made of mud-pellets mixed with straw and is lined with hay, feathers and other soft material.

> The swallow is a mason,
> And underneath the eaves
> He builds a nest and plasters it
> With mud and hay and leaves.

The four to six eggs are white with markings of brown and purple. The cliff or eaves-swallow is a square-tailed bird smaller than the foregoing, which builds numerous nests in colonies under the eaves of barns, other buildings and cliffs. The bank-swallows are our smallest swallows, being about five inches long. They dig tunnels in sand-banks, two or three feet deep with a nest of grass and feathers at the end. The tree-swallow has the under parts white. It nests in hollow trees or in bird-boxes near dwellings. The rough-winged swallow resembles the bank-swallow. It is common in the west, making nests in sand-banks. The purple martin is the largest of our swallows, being about eight inches in length. Swallows resemble the swifts or chimney-swallows and goat-suckers, but the latter belong to quite a different order. All swallows live in colonies. A pair is said to mate for life, but this may be but one of the numberless tales that make up the mass of tradition about this bird. Superstition has long protected the swallow, it being considered ill-luck to kill one. See MARTIN, NESTING-BOXES and SWIFT

Swan, water-birds famous for their long graceful necks, and related to ducks and geese. They inhabit temperate regions, and feed upon seeds, roots and fish-spawn. They have white plumage, except the black swan of Australia — a very beautiful bird with a long, neck, having a graceful curve. It is a dull black, with white on the wings, and a carmine bill crossed by a white band. The European swan, partly domesticated in parks is pure white and one of the handsomest of all birds. South America has a competitor for grace and beauty in the black-necked swan, a small swan with white plumage, except the head and neck which are dark seal-brown. The common swan reaches a length of about five feet and a weight of 30 pounds. The swans of North America are the trumpeter and whistler swans, with straighter necks and, therefore, less grace and beauty than other members of the group. They are smaller than the common swan.



SWAN

Swansea (*swŏn'sē*), a seaport of Wales, on Tawe River, 45 miles northwest of Cardiff, is the most important city of South Wales. Its growth is due to its tin-plate manufacture, two thirds of the British output being manufactured here. It also is the principal seat of copper-smelting in Great Britain, and in its vicinity are extensive coal-mines. It has large docks, covering 60 acres, a good harbor, and is several hours nearer the open sea than any other considerable port on Bristol Channel. The McKinley tariff greatly injured Swansea's tin-plate trade. Its charter dates from the days of King John. A tower is still standing of the castle built here by the Earl of Warwick in 1099. Population 114,673.

Swa'ziland'. See TRANSVAAL.

Sweatshops. The sweating-system is the engagement of men, women and children by a contractor to produce goods for the wholesale dealer, on which the workers are paid by the piece and the price is made as low as possible. It is called sweating because, as Charles Kingsley in 1850 first showed the world, it enables the contractor to keep cutting the price so low that even the ablest can just live by unceasing toil, while the less able, spurred to their utmost efforts, are often forced to go into debt to the contractor and thus to work for him, on his terms, at their utmost capacity until they can work no longer. Kingsley's revelations were followed by investigations. But the system has not been stopped. A congressional investigation in 1892 showed that 30% of all clothing manufactured in this country was made under the sweating system, under the following conditions: The sweating is done either in a "den," a room hired by the contractor, without any provisions suitable for a crowd of different sexes, and filled to its utmost capacity by people who can not afford to be clean or to stop working if sick; or else at home, where the garments or cigars are often handled by consumptives and filth abounds among the wretched toilers. They in many cases work 15 hours a day, seven days to the week. The chief products of "sweating" are garments, cigars, candy and bread. In recent years many states have taken measures to insure the decent condition of bake-shops and of places where candy is manufactured. New York has a law forbidding the manufacture of garments in bed-rooms or eating-rooms. In Illinois such a law is proposed, with the provision that if broken it is the contractor who engaged work in such a place that must

pay the penalty. It is comparatively easy to secure decent conditions in the "den," through factory-laws, which many states have passed. The matter has not yet received proper attention, however, in any state, unless in Massachusetts. The only way to secure proper wages is the formation of trade-unions among the workers, but this has been found very difficult, in view of the cheap labor poured into our cities from foreign countries. The action of the National Consumer's League in allowing its label to be placed only on goods made under decent conditions of work and of wages and in pledging its members to give the preference to such goods has produced some result, probably, and only requires that all consumers support it.

Swe'den, the eastern portion of the Scandinavian peninsula, is a kingdom. It is over 600 miles long; its greatest width is 200 miles; and it covers 172,876 square miles.

Surface. In the northern parts the land rises from the Gulf of Bothnia to the Kiölen Mountains, which form the boundary between Sweden and Norway, their highest peaks rising above the snow-line. South of this region is the mountainous district made up of the great table-lands of Jemtland and the valleys of Herjedal and Ljungan, where there are good pasturage and timber-lands. The mountainous region further south, from Lake Siljan to Lake Wener, is the mining part of Sweden, and includes the noted iron-mines of Danemora and the copper-works of Fahlun. Lakes Wener, Malar and Hielmar almost cut the country from east to west and, with Lake Wetter, make up a large lake-district, which is the commencement of the most fertile part of Sweden, the lower end of the peninsula between the Cattegat and the Baltic. The lakes cover one eighth of the surface; the largest is Lake Wener, the outlet of which to the Cattegat is the Göta, noted for its picturesque rapids. The rivers are small and unimportant, the largest being the Angerman. Summer and winter succeed each other with almost no spring or fall.

Resources. Usually not enough grain is grown to supply the home-market, though barley does better than oats or rye. Other crops are potatoes, hemp, flax, tobacco and hops. Pine, fir and beech are of great value for timber, tar, pitch, charcoal and firewood. These trees mainly make up the great forests which cover more than a fourth of the surface. Bears and beavers are scarce; but wolves, lynxes, martens, eagles etc. are common. Copper, iron, alum, vitriol, marble, lead, sulphur and a little coal, gold and silver are found; mining is the most important business after farming. Iron and shipbuilding head the list of manufactures. Iron, timber and copper are the chief exports; yarn, wool, leather, coal and cotton the main imports.

Government. The three provinces are Norrland, Svealand and Gothland, but for purposes of government it is divided into 25 governments. After Stockholm the capital (341,986), the largest city, is Göteborg (167,813). The Swedish permanent army of 100,000 men is in part quartered on the landowners, the soldiers working in time of peace as field-laborers in return for their support; in time of war they are paid by the crown. Every Swede between 20 and 25 must serve in the national guard, and a reserve of 284,200 men is formed of conscripts between 21 and 40. Sweden is a constitutional and hereditary monarchy, the succession being in the male line. The king has a council or cabinet of ten ministers. The diet meets every year; the upper house has 150 members chosen for nine years, who must have a certain amount of landed property or income; the lower house has 230 members. A small property qualification is required in the voter, who must be a native having attained his majority.

Education. Education is compulsory, and there are free schools. The University of Upsala was founded in 1476, and has 1,835 students; and the smaller University of Lund numbers 874 students. There are 113 high schools with nearly 25,000 pupils, and 14 normal schools with 1,437 pupils. The state church, to which the king must belong is the Lutheran; but no civil disabilities attach to those not of the national religion.

History. In early times the Swedes lived in the north of Sweden and the Goths in the south. Eric Edmundson is said to have first conquered the whole of Sweden near the end of the 9th century. At this time Swedish history begins, and we find the Swedes generally at war with their Norwegian and Danish neighbors and busily ravaging the eastern shores of the Baltic. In 1000 A. D. Olaf Schooszkönig was baptized a Christian, and the burning of the national temple at Upsala in the reign of Ingiald (1080-1112) finished the overthrow of the old pagan religion. The murder of King Eric in 1161 was the beginning of a disastrous period of civil wars, lasting 200 years. At length the nobles offered the throne to Margaret, queen of Denmark and Norway, thus uniting the three Scandinavian countries in 1347. In 1523 Gustavus Vasa made Sweden again independent of Denmark, founded a long line of Swedish kings, of which he himself was one of the greatest, and raised half-barbarous Sweden to an honorable place among civilized nations. In Vasa's reign Protestantism was made the state's religion. Gustavus Adolphus (1611-32), one of the greatest generals of his age, spent the greater part of his reign in wars with Poland and Russia for the possession of Ingria, Livonia and other Baltic districts and in defending

Protestantism in Germany. His affairs at home were ably managed by the wise Oxenstierna, who, after the death of Gustavus at the battle of Lützen, carried on the government during the minority of Christina. This strange queen's most popular act was her abdication. Carl XI (1660-97) so greatly increased the kingly power that the diet acknowledged it to be absolute. The warlike career of gifted but reckless Carl XII (1697-1718), who humbled Frederick IV of Denmark and Peter the Great of Russia and dethroned Augustus II of Poland, nearly ruined his country. Ulrica, his sister, was chosen queen on condition of giving up the absolute power wielded by the last two kings. In the reign of Ulrica the last of the Vasas, and of her husband Frederick of Hesse-Cassel, the country was divided into two factions of nobles—the Hats or French party and the Caps or Russian party. Gustavus III (1771-2) who recovered the lost power of the crown and put down these factions, was murdered. Carl XIII (1809-18) was forced to cede Finland to Russia. Carl was childless and chose Bernadotte, Napoleon's general and prince of Pontecorvo, as crown-prince. Bernadotte's success in getting possession of Norway endeared him to the people, and he ascended the throne in 1818 as Carl XIV. He ruled ably, and was succeeded by his son Oscar I (1844-59) and his grandsons Carl XV (1859-72) and Oscar II (1872-1907). Gustav V, the present king, succeeded in 1907. In 1905 Norway dissolved the union with Sweden. Population 5,476,441. See CHARLES XII, CHRISTINA, GUSTAVUS ADOLPHUS, GUSTAVUS VASA, GUSTAVUS V, NORWAY and OSCAR II. See Fryxell's *History of Sweden* (English translation).

Swe'denborg, Eman'uel, was born at Stockholm, Sweden, Jan. 29, 1688, the son of a bishop and of noble family. He graduated at the University of Upsala, and, after four years travel, was given a position in the College of Mines by Carl XII, who became his friend. For some years he busied himself in writing a host of scientific works, mainly practical, on bridges, air-guns, docks, blood-circulation, copper-manufacturing, etc. Suddenly his scientific work stopped, and in 1749-56 appeared a Latin work which he called *Heavenly Secrets*. He announced that the Lord had appeared to him and sent him to be the herald of a new church and that his office was to interpret the word of God according to its true meaning. *The New Jerusalem and Its Heavenly Doctrine* and many other theological works followed. Swedenborg made no effort to found a church, but confined himself to the work of announcing the new doctrines which were to be its basis. As a man he was modest and retiring, genial and happy, and lived a most simple and quiet life. He died at London, March 20, 1772. Since his death, religious societies have been founded on Swedenborg's teachings, and are banded together in America as the general convention, in England as the general conference, of the New Church. Consult Wilkinson's *Life* and compare Emerson's essay in *Representative Men*.

Sweet'bri'er or **Eg'lantine,** a prickly shrub of the rose family, native of the eastern states of the Union and to Canada. It grows densely, yet reaches a height of six or eight feet; about midsummer it bears sweet-scented, pink flowers and later produces a scarlet or orange-red fruit. Its dark-green leaves emit a fragrant odor from their russet-hued glands. The sweetbrier is commonly met with in fields and country byways.

Sweet Pea, (*Lathyrus odoratus*) a familiar garden-plant much prized for its beautiful perfumed flowers. There are not far short of 100 varieties in cultivation; and to raise them to perfection, the seeds should be planted two inches apart in a rich clay-loam, and it will be well to red-lead them, to protect them from mice and birds. As soon as the plants appear above ground, brush or small twigs should be spread around them for shelter, and later they should be given long stakes for support in their upward climb. Through the growing season occasional shallow cultivation will be required.

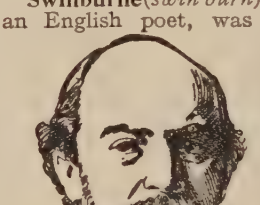
Sweet Pota'to, an edible, sugary vegetable, the tuberous root of a vine-like plant, grown largely in the southern states of the Union and in tropical and semitropical countries. It is also known as the sugar-yam. The sweet potato is rich in food-constituents (sugar and starch), the extent of its cultivation in this country being annually about 50 million bushels. Besides their use, cooked or canned, for the table the sweet potato is also fed to farm-animals; it is grown best in sandy or loose soils, and is a staple crop in the south.

Swift or **Chim'ney-Swal'low,** a small bird abundant in the eastern United States, nesting in chimneys. Notwithstanding its common name, the bird is not a swallow (*q. v.*), having only a superficial resemblance to the latter birds, while in structure it is very different. It is closely related to the humming-birds and the goat-suckers. The bird is about five and one fourth inches long, of sooty-brown color, with a paler throat. The feathers of the short tail end is sharp bristles, which aid in climbing. There is only one kind in the United States east of the Rocky Mountains, but there are about 50 species inhabiting the warmer parts of the world. In most of them the salivary glands are highly developed, and the secretion from them is used as a glue to hold the nest together and to its support. In China one species constructs a nest that is used in making soup.

Swift, Jon'athan, was born at Dublin, Ireland, Nov. 30, 1667, after his father's death, and was brought up in poverty, what little support he had being furnished by relatives. He spent seven years at Trinity College, Dublin, most of the time in disgrace with the authorities. He was taken then into the family of Sir William Temple, the politician and ex-minister. Four years later his pride drove him away from his patron's house, and he became a clergyman. But he soon threw up the Irish living he had had for two years, and went back to Sir William's service, remaining there till his patron's death in 1699 and publishing an edition of Temple's works (1700-03). In 1704 appeared his first work, *A Tale of a Tub*, the wildest and wittiest satire of the 18th century. This work cost him a bishopric and forced him to be contented for life with the deanery of St. Patrick's, Dublin In politics he at first was a Whig, but in 1710 he joined the Tories and became easily the most powerful pamphleteer in England, *The Conduct of the Allies* being an English classic. The death of Queen Anne put the Tories out of power, and Swift retired to St. Patrick's. His famous *Drapier's Letters*, written in 1724 against the copper-money which was to be supplied to Ireland by a man who had bought the right from the English government, made him at one bound the most popular and most powerful man in all Ireland. A reward of $1,500 was offered for the name of the author, but no one of the many in the secret thought of betraying him. At last the scheme was given up. In 1726 Swift published his most popular work, *Gulliver's Travels*. Almost as great a masterpiece is *The Modest Proposal*, in which he suggests, in seeming cold blood, that in order to relieve their poverty and distress the Irish should sell their children as food for the rich. Swift died on Oct. 19, 1745. See John Forster's *Life of Jonathan Swift* and Thackeray's *English Humorists*.

Swim'ming. The weight of the human body is so little greater than that of water, that it can readily be floated, especially when as in swimming, it is forced through the water by the arms and legs. Benjamin Franklin suggested, as a good way to learn to swim, to wade out breast deep and, tossing an egg into the water in the direction of the shore, to plunge after it; it will soon be discovered that it is easier to swim than to sink. In swimming on the breast the stroke is made by vigorously kicking out the legs—previously bent up—and at the same time thrusting the arms straight ahead in the form of a wedge, then drawing up the legs for another stroke, while the arms are swept through the water in the form of a half-circle. The stroke is made most powerful by keeping the feet as widely apart as possible. Breast-swimming is the easiest method and is always used for long distances. A faster way is to swim on the side; the under arm only being thrust forward, while the other is thrust downward and backward. In over-hand swimming each arm is thrown out of the water alternately, the swimmer at the same time turning from side to side; this is the fastest method. In swimming on the back the arms are not used at all. In treading water the swimmer stands upright and treads water as if walking up a pair of stairs. In floating the swimmer lies on his back, keeping only his face out of the water. It it easier to swim in salt than in fresh water, as the former is more buoyant. The Greek story of Leander's famous swim across the Hellespont was made probable by Lord Byron performing the same feat in 1810. In 1875 Matthew Webb, an Englishman, swam 20 miles in four hours and 42 minutes, and the same year swam the English Channel from Dover to Calais, the tide carrying him on a zigzag of about 50 miles in 22 hours. Agnes Beckwith, a 14-year-old girl, swam five miles in 67 minutes.

Swinburne(*swĭn'bûrn*), **Algernon Charles,** an English poet, was born at London, April 5, 1837, the son of Admiral Swinburne. He was educated at Balliol College, Oxford, and spent some time in study in France. Two plays, *Queen Mother* and *Rosamond*, were his first writings, followed by his best-known poem, the tragedy of *Atlanta in Calydon*. His later poems are *The Armada* and *An Autumn Vision*. Swinburne enjoys great popularity in America as well as in England, being especially remarkable for his facile metrical invention; and for a time was under consideration as successor to Tennyson in the English laureateship. His chief prose-writings include *Shakespeare*, *Ben Jonson*, *Victor Hugo*, *Wm. Blake*, *Essays and Studies* and *Prose Miscellanies*. Died April 10, '09.



ALGERNON C. SWINBURNE

Swine or **Hogs** are among the most important of food-animals. For the wild boars, from which swine are probably descended, see BOAR. The word boar is now used of the male hog; the female is termed sow; and the young are called pigs, and the flesh pork. A sow has two litters a year of eight to twelve pigs each or even more. Fresh pork is held to be unwholesome in warm countries, but salted and smoked or otherwise cured, it is a favorite and healthful food in warm climates. The fat, as lard, is largely used in cooking; the bristles are

used in making brushes, and the skins make a tough and flexible leather, used in the manufacture of saddles, trunks and other forms of leather goods. Much attention has been given to the breeding of swine with a view to improvement in respect to increased size, hardiness, early development, fattening qualities, flavor of the pork, etc. Among the popular breeds are the Berkshire, from the English county of Berks; the Poland-China, which was first bred in Ohio; the Chester Whites, an American strain of the Yorkshire; the Durocs or Jersey Reds, and the Tamworth. Pork-packing is one of the great branches of business in the United States. Its leading centers are Chicago, Kansas City and Omaha, in the order named. In the year ending on March 1, 1907, the number of hogs packed and marketed was 30,978,000; the total value of the hog-products exported from the United States in 1905–6 was $128,996,441. See STOCK-RAISING and STOCK-YARDS.

Swit'zerland, an inland country of central Europe and a federal republic. Its greatest length from east to west is 180 miles, its greatest width from north to south 130 miles, and its area 15,976 square miles. It lies between Austria on the east, France on the west, Germany on the north and Italy on the south.

Surface. Switzerland is the most mountainous country on the globe. Its principal chains are the Alps and the Jura. The Alps run from east to west along the southern or Italian frontier, and their windings and spurs fill more than half the country. The mean height of the highest chain is from 8,000 to 9,000 feet. The Jura run northeast from the western corner of Switzerland, and are a series of parallel ridges shutting in long and narrow valleys; their mean height is not over 4,000 feet. In the angle between them and the Alps lies the plain of Switzerland, 1,400 feet above the sea and 100 miles long by 20 to 30 broad. East of this tableland is the Thur hill-country between Lakes Zürich and Constance. The Jura, the plain and the hill-country are the main divisions of northern Switzerland. The Alpine region is divided into the valleys drained by the Rhône; those drained by the Ticino; the Grisons, valleys drained by the branches of the Rhine and Danube; the Bernese Oberland, sloping toward the plain of Switzerland; and the Forest cantons, surrounding Lake Lucerne. Everywhere above 9,500 feet high the mountains are covered with everlasting snow, which descends along the hollows in glaciers to a much lower level, and in this way covers the higher parts of the country with a vast sea of ice. The lowest part of Switzerland is in the valley of the Rhine, between Constance and Basel and the banks of Lakes Zürich and Maggiore.

Resources, Manufactures, Commerce. Good coal is not to be had, and the houses are mostly wooden, so that the forests, which cover one sixth of the surface, are very valuable. The trees, cut on the heights and trimmed of their branches, are slid down the icy slopes to the valleys below and loaded on rafts. The chief business is that of the herdsmen and shepherds, who spend the summer with their cattle on the mountains, living in rude huts called châlets, and there the butter and cheese are made. The plain of Switzerland is a rich farming-region; large quantities of grapes are grown at Vaud and Neuchâtel, and the orchards of the Thur country and Lake Constance furnish *kirchwasser*, the common drink. Out of every 100 square miles 30 are filled with rocks, glaciers and water; 17 with forests; 11 with plowed lands; 20 with meadows; and one with vineyards. The manufactures are chiefly confined to the northern cantons — silk in Zürich, Aargau, Glarus and Basel; cotton in Zürich, St. Gall, Appenzell, Aargau, Glarus and Neuchâtel; watchmaking in Geneva and Neuchâtel; straw plaiting in Aaargu and Lucerne. Though without a seaport, Switzerland's trade in proportion to population has long been greater than that of any European country, except England. The chief imports are wheat, salt, raw silk and cotton; the chief exports are cheese, condensed milk, food-stuffs, charcoal, cattle, silks, cottons, watches and jewelry.

Government, Education, Communication. Each of the 25 cantons of Switzerland rules its home-affairs, in some of the cantons by means of a representative assembly, in others by the *landesgemeinde* or assembly of all the men in the canton. The federal legislature has two houses, the state council and the national council. The president, elected by the federal assembly for one year, has little power, being merely one of the federal council of seven, which is chosen for three years. Almost every head of a family has his plot of ground, and there are no great estates or powerful land-owners. There is no standing army, but every citizen is obliged to serve as a soldier. Children are taught at school to bear arms, from the age of eight passing through annual exercises and reviews. In eighteen cantons German prevails; in five, French; in one Italian; and in one, Roumansch, a Latin dialect which lingers in the Grisons. Basel, Bern and Geneva are the centers of the Protestant part of Switzerland, while the Alpine region is almost wholly Catholic. Three years' schooling is required for every child, and in every district are primary and secondary schools. There are many higher and specialized schools that are largely attended; and universities at Basel, Bern, Zürich, Geneva, Lausanne and Fribourg.

Basel University dates to 1460. The attendance in the universities is 5,626, with a total teaching staff of 641. Switzerland has 1,805 postoffices; 2,969 miles of railway; and a very complete system of telegraphs, which is almost wholly under state control. The chief towns are Zürich (189,088), Basel or Bâle (131,914), Geneva (125,520), Bern (85,264) and Lausanne (63,926).

History. The first people of Switzerland were the Helvetii in the northwest and the Rhætians in the southeast, both of whom were conquered by the Romans and had parts of their territories settled by Burgundians, Alemanni and Goths. From the 5th to the 7th century Christianity was adopted. In the early part of the middle ages the country formed part of the Holy Roman empire. In the 13th century civil wars broke out, during which many of the towns obtained special rights and charters. The attack of Emperor Albert I on the great towns caused the men of the forest cantons in 1307 to begin a war against Austria, which gained them freedom in 1315. A league of eight cantons was formed in 1352, followed by other wars with Austria, ending with the famous Swiss victory of Sempach. In 1415 Aargau and Thurgau were conquered from Austria, and Ticino, beyond the Alps, was annexed three years later. In 1476 the battles of Granson and Morat (Murten) were won from Charles the Bold, and in 1499 Emperor Maximilian, was defeated in six engagements. Zürich, under the preaching of Zwingli became a Protestant city in 1523, followed by Bern and other northern cantons. A religious war was waged against the Roman Catholic forest cantons, in which the Catholics were successful. In the treaty of Westphalia, at the end of the Thirty Years' War in 1648, the European states acknowledged the independence of Switzerland. The French seized Switzerland in 1798, but it recovered its freedom in 1814. The powers of Europe then guaranteed its perpetual neutrality and the inviolability of its territory. Since that time the chief events have been local rebellions and other attempts of the people in the various cantons to get back powers which they had gradually lost to corporations and great families. In 1844 the radical party organized bodies of armed men, called the Free Corps, for the purpose of driving out the Jesuits. The Roman Catholic cantons formed in their defense the league called the *Sonderbund*. After several town-revolutions a majority of the federal diet declared against the Jesuits and the *Sonderbund*, and waged a successful civil war against the Catholic cantons. The present constitution was chosen in 1874. Population 3,741,971. Consult Zschokke's *History of Switzerland* (English translation): *The Swiss Confederation* by Adams and Cunningham; and *Switzerland* in the Story of the Nations Series.

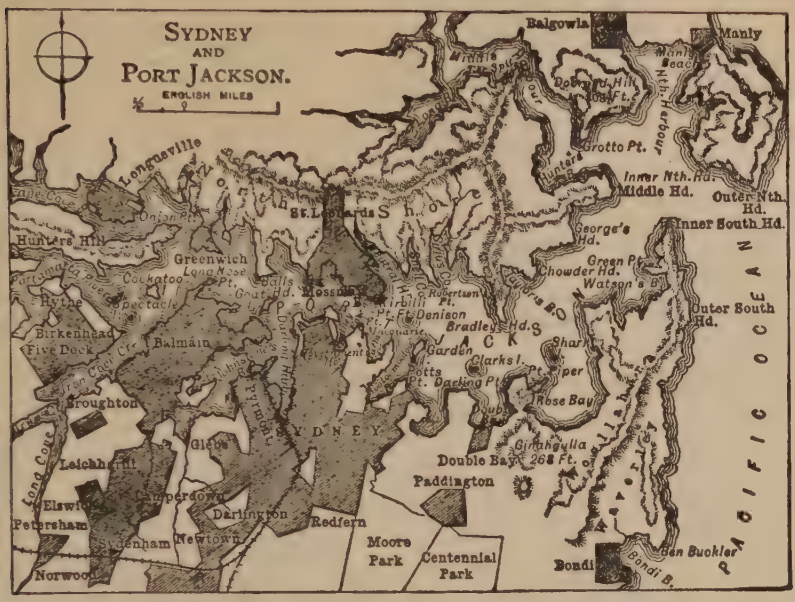
Sword'fish', a large fish of the open sea, having the bones of the upper jaw extended into a long blade. There is only one species, found abundantly in the Mediterranean, less abundantly along the New England coast. It is also found in the Pacific and other seas. The body is rather elongated but stout, the dorsal fin high, the ventrals absent. These fish are dark-blue in color, and range in length from four to fifteen feet or more and from 150 to 800 pounds in weight. They eat nearly all kinds of fish. Rising in the midst of a school, they strike several with the sword and eat them deliberately. They are sought as food, and harpooned from the bowsprit of small vessels. In former years about one and one half million pounds, annually, were brought into eastern ports of the United States.

SWORDFISH

Syc'amore, the common name in the United States of the plane or buttonwood, well-known for its white bark, broad leaves and round balls. The true sycamore is a species of fig, common in Egypt. The wood is so lasting that it was used for mummy cases. It is the tree mentioned in the Bible. The plane or buttonwood is a tree of infinite dignity, rises to a considerable height, and lives to a great age. The height is from 60 to 100 feet, the branches are of wide-spreading habit, and the free peeling of the dark outer bark reveals the glistening white inner bark and gives a mottled appearance to trunk and branches. The tree is vigorous, foliage abundant, leaves bright yellow-green above and paler below. On into winter the fruit remains on the tree, brown balls hanging from the ends of long peduncles. It is a favorite shade-tree, and is distributed generally in the country, being found in rich bottom-lands and along the banks of streams. The wood is reddish brown. Though not strong, it has a beautiful grain and is used for furniture and interior finish, and is also employed for cigar-boxes.

Syd'ney, a city of Australia, the capital of New South Wales (*q. v.*), is on Port Jackson, a bay of the Pacific Ocean. The city looks like an old English town, with fine public buildings, as the exchange, the government-house, the parliament-houses, the treasury, the museum, the national art-gallery, the university and two cathedrals. It has fine parks and a botanical garden of 38 acres.

There are four colleges connected with the university, which has a faculty of 76 members and an attendance of 1,054 students. There also are a college for women, a free museum, a public library of 179,641 volumes and an



observatory. It has a fine harbor, with extensive shipyards and docks, and is defended by several forts and batteries. Population 605,900. See AUSTRALIA.

Sydney, Canada, next to Halifax, is the largest town in Nova Scotia. It is a coal-shipping port and is equipped to accommodate ocean-liners. It has a deep-water harbor open throughout the year. Population, nearly 18,000.

Symbiosis (*sĭm-bī-ō'sĭs*) (in plants), the living together of two kinds of organisms in more or less intimate relation. The word sometimes has a very general application, including even such a case as a vine and the tree upon which it climbs. Generally, however, it is used only in connection with cases of intimate organic union. The most notable case is the association of an alga and a fungus in the formation of a lichen. Various forms of symbiosis are recognized, dependent upon the significance of the relationship between the two symbionts. Parasitism is one form, in which one symbiont is more or less injurious to the other. This form is amply illustrated by the numerous cases in which parasitic fungi attack living plants and animals. Mutualism is that form of symbiosis in which the relation between the two symbionts is mutually helpful. Many botanists consider the lichen an illustration of this, in which the alga and fungus are of help to one another. Helotism is a form of symbiosis in which one organism enslaves another to use its products. In this case the enslaving symbiont is benefited, while the enslaved symbiont is neither injured nor benefited. Many botanists think that this is the form of symbiosis displayed by lichens, the fungus enslaving the alga in order to obtain the food which it manufactures and still protecting it within the meshes of the mycelium. Root-tubercles and mycorrhiza also are illustrations of symbiosis of complex character. In fact, the phenomenon of symbiosis is displayed more extensively among plants than was formerly supposed. See LICHENS, MYCORRHIZA and ROOT-TUBERCLES.

Symmes, John Cleves, an American pioneer, was born on Long Island in 1742. He obtained from Congress in 1788 a grant of 1,000,000 acres along the Ohio between the two Miami Rivers, and a colony from New Jersey made the first settlement, naming the town Losantiville, which was changed by Governor St. Clair to Cincinnati. Symmes City also was founded at North Bend, a few miles below, and for some years was a rival of Cincinnati, until Fort Washington was established at the upper town.

Symmes, John Cleves, nephew of the above, was born in 1780 in New Jersey. He was in the War of 1812, and afterwards settled at Newport, Ky., where in lectures and writings he developed his idea that the earth is a hollow globe, and can be inhabited. He died at Hamilton, O., May 28, 1829.

Symonds (*sĭm'undz*), **John Addington,** an English man-of-letters who wrote largely on Italian history and literature, was born at Bristol, Oct. 5, 1840, and died at Rome, April 19, 1893. His chief writings are an *Introduction to the Study of Dante; Studies of the Greek Poets; The Renaissance in Italy; Italian Byeways;* with *Lives* of Shelley, Ben Jonson, Sir Philip Sidney, Boccaccio, Benevento Cellini, Michael Angelo, Walt Whit-

man and *Shakespeare's Predecessors in the English Drama*. His work is marked by accurate learning and much critical insight. *The Renaissance in Italy* is his chief work.

Sympathet'ic Nerv'ous Sys'tem, a nervous system developed in vertebrated animals above the fishes. It consists of a double row of ganglia united by nerve-trunks, and is located within the cavity of the body, along each side of the spinal column. In this way two chains are formed, reaching from the base of the skull to the end of the body-cavity. The ganglia are collections of gray matter or nerve-cells, and nerve-fibers pass through them to and from the spinal cord. The sympathetic system is connected with the central nervous system by numerous nerve-trunks or communicating branches. It also sends branches to the viscera. It acts as a kind of relay center for regulating the blood-supply to the abdominal viscera and assisting in other involuntary actions. See Gray's or Quain's *Anatomy* for a longer description.

Sympetalous Flowers, those in which the petals are more or less united, as distinguished from those which are polypetalous. The sympetalous condition is characteristic of families of the highest rank, in which the corolla takes such forms as a bell, urn, tube or trumpet. See FLOWER.

Synagogue (*sĭn'ȧ-gŏg*), the Jewish house of worship. They were first established in Judaea, when the country was under the Greek and the Persian rule, and were sometimes used for schools. The synagogue has seats and desks on the floor for the men and galleries for the women. There are an ark containing the Hebrew copies of the books of Moses, a platform for the reader, a smaller platform for the preacher and in modern synagogues, a place for the choir. The congregation must face the east while certain prayers are recited.

Syncarpous Flowers, those in which two or more carpels are organized to form a single pistil, commonly called a compound pistil. See FLOWER.

Syndicalism, the socialistic philosophy which teaches that collective ownership by the workers of the means of production should be gained by direct action, namely, by the general strike and sabotage. Sabotage is the destroying or marring of the product as it passes through the hands of the workmen in the factory. Syndicalism is opposed to government because the latter upholds the rights of property and the capitalist class. It preaches unremitting class war. The International Workers of the World endorse its principles.

Synergids (*sĭn'ẽr-jĭds*) (in plants), two cells which are associated with the egg in angiosperms, and with it form the group of three cells, called the egg-apparatus. This group is situated at the micropylar end of the embryo-sac, to which the pollen-tube comes. The name means helpers, and refers to the fact that these cells are of service in the process of fertilization. During this process one of the synergids becomes disorganized, contributing of its substance to the nourishment of the pollen-tube and its contents. See EMBRYO-SAC.

Syr'acuse (*sĭr'ȧ kūs'*), **N. Y.**, county-seat of Onondaga County, is on Onondaga Lake, about halfway between Albany and Buffalo. It is a handsome city, with broad, shaded streets and ornamental squares. The state armory, asylums for weak-minded and three asylums for orphans, a home for aged women, savings-bank, courthouse, the new high school, Kirk Block, John Crouse College of Fine Arts, the Hall of Languages and the First Presbyterian church are among the noteworthy buildings. The manufacture of salt has been an industry since 1654 when the springs were visited by the Jesuits and the salt carried to Quebec. The supply is supposed to be inexhaustible, but the brine does not produce the best quality of salt; which is still obtained from the local wells to the extent of 2,000,000 bushels per year. In 1870 the output was over 8,000,000 bushels, but there is lively competition now at Warsaw and in Michigan. The extensive works of the Solvay Process Company are the principal industry, 2,800 men being employed and $5,000,000 invested. Caustic soda, bicarbonate of soda, soda-ash and crystals are the principal products, but carbolic acid, picric acid, coke, ammonia, tar and other coal-tar products are also made by this company. Brine is brought through iron pipes to the works from wells which the company sank 20 miles from the city. It was in the sinking of these wells that the main source of the brine, which had so long been used in Syracuse, was located in a mass of solid salt. Into some wells it was found necessary to discharge fresh water. When it became saturated it then was pumped to other wells and through pipes to the works. The limestone used by this company is brought from Split Rock. Large buckets, suspended on overhead wires and operated by steam-power, carry the material. They run in close connection and continuously, carrying 1,000 tons in 12 hours. The "waste" product is white like marl, possessing no sustenance for vegetation, but has been used to fill the surrounding lowlands. In this way hundreds of acres have been filled to a great depth, and places of deposit are now so limited that Onondaga Lake is to be used as a place of discharge. Besides this enormous business, typewriters and automobiles are extensively manufactured, as are recorders, chilled plows, furniture and shot-guns. In the city are Bessemer steel-works, blast-furnaces and foundries. The city expends $[illegible] to maintain its public schools, which have 514 teachers and 22,177 pupils. Syracuse has 116 churches and missions

and four principal hospitals, and each has its training-school for nurses. Carnegie Library has 75,000 volumes, aside from those in substations, and is free to all. In the Court of Appeals is a library of value, supported by the state. Syracuse was first settled by an Indian trader in 1787. In 1780 it was called Salt Point, and the manufacture of salt begun by white settlers. The place was soon called Salina, and grew slowly until it was incorporated as a village in 1825. In 1847 Salina and Syracuse, which were rival villages, were united under the name of Syracuse. Population 137,249. See SYRACUSE UNIVERSITY.

Syracuse or **Siracusa**, a city, once the largest city of Sicily, its walls being 22 miles around and its inhabitants numbering anywhere from 500,000 to 1,000,000. It was formed of five towns, and sometimes was called Pentapolis. Ortygia, the first part of Syracuse, was built on a small island, connected with the mainland by a causeway. The modern city is fortified, and has palaces, churches, convents and a fine cathedral, built on the site of the ancient temple of Minerva. There are many ruins of the ancient city — the old theater, cut out of the rocks, with sixty rows of seats, for 24,000 spectators; ancient quarries, 60 to 80 feet deep, sometimes used as prisons, one of them being called The Ear of Dionysius; a great aqueduct; and extensive catacombs. The fountain of Arethusa, on the island of Ortygia, has been restored by the city. The trade is in wine, brandy, oil, fruits, salt, saltpeter and sulphur. Syracuse was founded by the Corinthians in 734 B. C., and grew rapidly, sending out several colonies. The government was in the hands of a few leading families, and in 487, after a revolution in which the people had driven them out, they returned, and Gelon, the despot or tyrant, became master of Syracuse. He was a great ruler and the city prospered under him, as also under the reign of Hiero, his successor. In 466 Thrasybulus was expelled, and the city enjoyed a free government for 60 years, during which it was victorious over Athens. Dionysius restored the "tyranny," strengthened the city, and overcame Carthage. In 212 B, C. the city, which had joined the Carthaginians, was conquered by the Romans. It was burnt by the Saracens in 878, and has been three times nearly destroyed by earthquakes. Population 32,030. See SICILY.

Syracuse Univer'sity, Syracuse, N. Y., is a coëducational institution. It has Colleges of Liberal Arts, Fine Arts, Medicine, Law Applied Science, a Teachers' College, the New York State College of Forestry, and Agriculture, a Graduate School, a School of Oratory, Library School, Summer School, and a School of Photography. It is picturesquely situated on a hill overlooking Onondaga Lake, and was founded in 1870. The faculty numbers 315, the students 4,000. Syracuse University is well endowed and has a library of 100,000 volumes.

Syria (*sĭr'ĭ-ȧ*), division of Turkey, lying on the Mediterranean Sea between Asia Minor and Arabia, including 114,530 square miles. The country is crossed from north to south by a double mountain-chain, Lebanon, the highest part having its summit 10,000 feet above the sea. The valley between the two ranges, Lebanon and Anti-Libanus, is about 2,300 feet above the sea, and was the site of the cities of Heliopolis and Baalbek. This valley separates into two parts, through one of which the Leontes River makes its way to the Mediterranean, while the other descends rapidly to the valley of the Jordan. At the Lake of Tiberias the valley is 650 feet below the level of the sea, and at the Dead Sea, 60 miles below, it is 1,300 feet below sea-level. The region around the Dead Sea is full of salt and without vegetation. The coast is broken by the bays of Tripoli, Beirut, Acre and Saida. The Jordan, Litany (Leontes), Asi (Orontes), Barada and Awaj (the Abana and Pharpar of the Bible) are the principal rivers, with the Euphrates on the eastern border. The plains of Esdraelon, Sharon and Gaza are level tracts, and the region around Damascus is a sandy desert in which are the ruins of Palmyra. Iron, quicksilver, coal, salt and bitumen are the minerals. The climate varies from the cool summers of the slopes of Lebanon to the tropical heat of the Jordan valley, with a dry season from April to October. In spite of imperfect methods and ancient implements in agriculture, the crops are large. Wheat, barley, rice, cotton, hemp, indigo and tobacco are important crops, while all kinds of fruit are grown. Vineyards cover the hills, and forests of cedar and pine the mountains. The horses are very strong and handsome; the broad-tailed sheep is found here only; cattle are small and poor; and wild animals abound in the mountains. Manufactures are unimportant, though the rearing of silk-worms is carried on extensively. Its chief city is Damascus, with a population of 350,000.

The people are of many races and sects. The Mohammedans are mostly Arabs, though there is a small proportion of Turks, the ruling race. The Mohammedans, Druses, Maronites, adherents of the Greek church, Armenians, Catholics, Protestants and Jews represent the religious divisions. The schools are carried on mainly by the Greeks, Catholics and, especially, by the American Protestant missionaries, who founded the Presbyterian college at Beirut. The Syriac language belongs to the Semitic group, and is an Aramaic dialect. Ancient Syriac still is the sacred language of the remnants of the Christian churches of Syria and Asia Minor, though it practically is a dead lan-

guage even to the best educated among them. The oldest book in Syriac still existing is a translation of the Bible, made about 200 A. D.

The kingdom of Damascus, which occupied the central part of Syria, was conquered by the Assyrians about 740 B. C. Along the Mediterranean was Phœnicia, with such cities as Tyre and Sidon, the greatest commercial nations of the ancients, but conquered also by the Assyrians. Anakim, Canaanites, Ammonites and Moabites were tribes living beyond the Jordan and in the southwestern parts of Palestine. The entrance of the Israelites into Palestine took place about 1500 or 1300 B. C., and their power lasted 1,500 years. A part of the nation, the ten tribes, were taken captive by the Assyrians in 721, the Samaritans found in the country at the time of Christ being descendants of the remnant of the Israelites and the colonists from Babylonia, that took the place of the captives. Judah fell before Nebuchadrezzar, but the people were restored to their land after 70 years of exile, though the country was still governed by Persian rulers. The battle of Issus (333) gave Syria to Alexander the Great, but at his death the country was divided, Egypt holding Palestine and Seleucus Nicator ruling northern Syria, where he built Antioch, for many centuries one of the greatest of eastern cities. Syria was conquered by the Romans about 63 B. C., and ruled by Roman officers. In the 7th century A. D. it became a part of the Mohammedan empire, and in the 11th century was in the hands of the Seljuk Turks, whose cruel treatment of Christian pilgrims led to the crusades. The Christian princes ruled only a short time, the land being overrun by the Mamelukes and the opposing forces of Tamerlane. Since 1517 it has belonged to the Ottoman empire. Population 3,675,200. See JEWS and PALESTINE.

Syrin'ga, a genus of Old-World plants, natural order *Oleaceæ* (lilac). They are deciduous shrubs, comprising six known species, native of southeastern Europe and Asia. Flowers in terminal panicles and very fragrant. The term, as popularly used, signifies the beautiful shrub, *Philadelphus Coronarius*, a native of Japan, often seen in gardens and commonly known as sweet syringa or mock-orange. Its cream-colored, fragrant flowers somewhat resemble orange-blossoms.

T

T (*tē*), the twentieth letter, is a nonvocal consonant. From its mode and place of articulation, the tongue touching the gum behind the teeth, it is classed as a voiceless dental or as a palatal, as in *tie*, *it*, *note*. *T* is silent in some words, as *chasten*. Unaccented *ti* before a vowel is *sh*, as in *nation*. *T* before diphthongal *u* (that of *use*) is *tsh*, as *nature*. *T* with *h* forms *th*, soft as in *baths*, *though;* hard as in *bath*, *thin*. *Th* is *t* in *Esther*, *phthisic*, *Thames*, *Thomas*, *thyme;* and is silent in *asthma*, *isthmus*.

Tab'ernacle was the tent first raised by Moses in the desert as a sign of God's presence among the people. It was divided into the sanctuary proper, which formed the front part, and the holy of holies. A sort of court-yard, formed by curtains hung between columns, ran round the tabernacle. The entrance was toward the rising sun, and was shut in by another costly curtain, into which, as in the first covering, figures of cherubim were woven. The court was much larger on the eastern side, for here the people gathered to worship. Here also stood the altar, made of acacia wood, on which a fire was kept burning, and the brazen laver or basin. The sanctuary contained the gilded table holding the showbread, the golden candlesticks and, in the center, the golden altar of incense, upon which the high priest burned incense morning and evening. In the holy of holies was kept the ark of the covenant, an acacia box gold-plated and gold-lined, in which were kept the two tables of the Ten Commandments. On top of the ark were the two cherubim, and between them the symbolical presence of Jehovah — the shechinah. Only once a year, on the Day of Atonement, did the high priest enter the holy of holies, while the sanctuary was the ordinary place of the priests, and the court that of the Levites. The Levites had charge of the tabernacle, carrying it from place to place on the march of the Israelites. The tabernacle was permanently set up in Shiloh, and was probably removed to Nob and thence to Gibeon, from which Solomon seems to have carried it away that all the nation might worship at Jerusalem.

Ta'bor, a celebrated mountain of northern Palestine, rising from the plain of Esdraelon to a height of 1,000 feet, commands the widest and finest view in Palestine. It is thickly clad with forests of oak and other trees. It was renowned from early times as the place of Christ's transfiguration, though it is now believed that at one time a city stood on its summit. In the times of the crusades Tabor was studded with churches and monasteries. Here Deborah and Barak summoned the warriors of Israel before the battle with Sisera; 10,000 Jews were slain near by in a battle against the Romans in 55 B. C.; and at its foot Napoleon gained a great victory over the Turks.

Tabriz (*tȧ-brēz'*), an old city of Persia, on Aji River, 40 miles from Lake Urumiah. A ditch and a brick-wall with seven gates surround the city. Water, a rare thing in the east, is plentiful. The fine ruin of the Blue Mosque is covered in part with arabesqued, blue tiles. The citadel is a brick-building, whose walls have been cracked by earthquakes. The chief manufactures are leather silk and gold- and silver-smithing. Tabriz is on a caravan-route, and is a city of business importance, doing a large trade with Russia. Tabriz, the ancient Tauris, became the capital of Armenia in 297 A. D. Zobeida, the wife of Haroun-al-Raschid, greatly enlarged it. It was sacked by Timur in 1392, and after being held by the Turkomans was taken by the Persians in 1500. The place has often been damaged by earthquakes, that of 1721 causing, it is said, the death of 80,000 persons. Population 200,000. See Eastwick's *Three Years in Persia*.

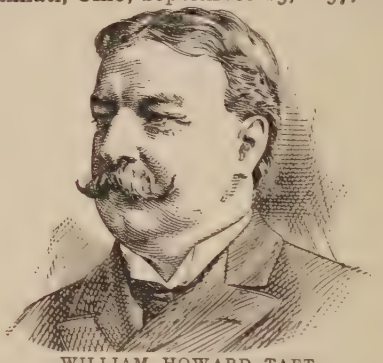
Tacitus (*tăs'ĭ-tŭs*), **Publius Cornelius,** a Roman historian, was born probably about 55 A. D. He enjoyed the favor of Emperors Vespasian, Titus and Domitian, and married a daughter of Agricola (*q. v.*). He held several public offices, became known as an orator, and was a close friend of the younger Pliny, through the appointment of the two to carry on the prosecution of Marius. Eleven of his letters are addressed to Pliny. Tacitus probably lived for a time after Hadrian came to the throne. His *Life of Agricola* (A. D. 98) is one of the finest biographies ever written. His other works are *Histories* (104–110), *Annals*, *Germany* (98), and his *Dialogue on Orators* (A. D. 79), the first and least valuable of his writings. These histories rank among trusted sources of knowledge of the times of which they treat, and have given their author high rank among the world's historians. But Tacitus is not one of the authors in whom our confidence is increased by rereading.

His account of Tiberius is manifestly unjust, being steeped in the prejudices of the Roman aristocracy and drawn from a poisoned source. He died, it is thought, in 120 A. D.

Tacoma (*tà-kō'mà*), **Wash.,** county-seat of Pierce County, is on Puget Sound at the head of navigation. The sound, which is from three to five miles wide, narrows near Tacoma to an inlet known as Commencement Bay, less than a mile wide but five long. The city is built on a bluff 200 feet high, overlooking the sound and the Cascade range, with the snowy peaks of Mt. Rainer, also known as Mt. Tacoma, in the distance. The city was laid out by the Tacoma Land Company, an organization by the managers of the Northern Pacific Railroad, which in 1873 bought 16,000 acres near the little village of Rainier, that consisted of one sawmill and the houses of its workmen. They made it the terminus of their road and built two hotels, the second costing $750,000. The salmon-fisheries of Puget Sound, the hop-fields in Puyallup Valley, the great forests of white pine and cedar on the neighboring mountains and the coal, iron and other minerals of the region furnish the materials of the large trade of the city. Regular transport-service has been established between Tacoma and London, trains laden with hops meeting the steamers at New York, and its harbor is a starting-point of steamers for Alaska. The works of the Tacoma Lumber Company cover 80 acres in the city, and it owns 150,000 acres of timber-land and 5,000 of coal-land. More than 40 establishments are engaged in the manufacture of lumber and other products of wood-working factories. The lumber and other products are loaded at the wharves for China, Japan and Australia. There also are large smelting-works and wheat elevators, rolling-mills, car-shops, flour-mills, iron-foundries, smelters, a large private dry-dock, meat-packing establishments and the most extensive fisheries-plant in the United States. Tacoma has ten banks and one foreign branch-bank (London). The public-school system includes a high school, with manual-training department and grade-schools, numbering 29, while the cost of maintaining the schools is $245,000 annually Tacoma also is the seat of Puget Sound University (M. E.), Washington College, Annie Wright Seminary (Episcopal), Academy of the Visitation (R. C.), the Y. M. C. A's. evening-institute and other institutions. There are fine public buildings, a free library and an ethnological and historical museum. The Great Northern, Northern Pacific and Tacoma Eastern railways serve the city. The following roads are building into it: The Union Pacific, Southern Pacific, Chicago, Milwaukee and St. Paul, Canadian Pacific, Chicago and Northwestern, North Coast, Portland and Seattle and Port Townsend Southern. Population (1910), 83,743.

Taft, Lora'do, American sculptor, was born at Elmwood, Ill., April 29, 1860, and graduated at the University of Illinois and at *École des Beaux Arts*, Paris. In 1886 he settled in Chicago, and became instructor in its Art Institute and lecturer on art at the University-Extension-Department of the University of Chicago. He has produced many busts and ideal subjects, and among other fine decorative work of his was that of the horticultural building of the Columbian exposition. The symbolic beauty and fine workmanship of these decorations won great praise. Among his many works are a bust of Schuyler Colfax in Indianapolis, a statue of General Grant and the fine reliefs for the Michigan regimental monuments on the field of Gettysburg. Mr. Taft is a member of the American Sculpture Society and of the Western Society of Artists.

Taft, William Howard, twenty-sixth president of the United States, was born in Cincinnati, Ohio, September 15, 1857, where



WILLIAM HOWARD TAFT

in 1880, after graduating with honors from Yale, he began practicing law and became, successively, prosecuting attorney for the county, a judge in the Superior Court, solicitor general of the United States, and from 1892 to 1900 judge of the Federal circuit court, receiving the L.L.D. degree from Yale and becoming dean of the Cincinnati Law School. In 1900 he was made President of the Commission to set up Civil Government in the Philippines. Made Civil Governor in 1901, he rendered distinguished service by establishing a governmental system and settling the friar land problem. Appointed Secretary of War in 1904, he showed equal zeal and ability in promoting the construction of the Panama Canal and aiding in the reconstruction of Cuba. In 1908 he was nominated by the Republicans and elected President by enormous pluralities. Among the most important events of his administration were the passage of the Payne-Aldrich tariff, the acts establishing Postal Savings Banks and the Parcel Post systems, the

Canadian reciprocity agreement, and the signing of general arbitration treaties with France and Great Britain. The reciprocity agreement was rejected by the Canadian parliament and the senate failed to ratify the arbitration treaties. The Payne-Aldrich act was severely criticized as a violation of the promise of the platform to reduce the tariff. President Taft was also charged with being hostile to the conservation movement, in connection with which he removed from office Chief Forester Pinchot. Owing to dissatisfaction with Mr. Taft's course, particularly on the tariff and conservation, his party was sharply divided, and after his renomination, what was known as the Progressive wing of the party held a convention of its own, and, as the National Progressive Party, nominated Theodore Roosevelt. The Democratic candidate, Woodrow Wilson, was elected. Following his defeat Mr. Taft became Kent professor of law at Yale, a position he filled with distinction.

Taganrog (*tȧ-gȧn-rôk'*), a seaport of southern Russia, stands on the northern shore of the Sea of Azov. It was founded by Peter the Great in 1696. The shallow harbor forces ships to unload into barges half a mile from the quay. Wheat is the chief export, but linseed, skins and wool are also sent out. The place is strongly fortified and is the main port of the Sea of Azov. Alexander I built a beautiful palace and has a monument here. Other buildings are the admiralty, cathedral and marine hospital. French and English gunboats damaged Taganrog by bombardment in 1855. Population 58,928.

Taglioni (*tȧl-yō'nē*), **Maria,** perhaps the world's greatest dancer, was born at Stockholm, Sweden, on March 18 or April 23, 1804. Her father was a noted Italian ballet-master, and under his guidance she first danced at Vienna in 1822. Five years later Paris went wild over the accomplished ballet-girl. She married Count Gilbert de Voisin in 1847, and left the stage. She died on April 23, 1884.

Ta'gus, the largest river of the Spanish peninsula, rises on the frontier of New Castile and Aragon, flows through Spanish and Portuguese territory, and, after 540 miles, falls into the Atlantic by an inlet at some places five miles broad. Near its source, and also near Toledo, the river runs between rock-walls several hundred feet high. The navigable part of the river, 115 miles, is wholly within Portugal. Lisbon and Toledo are on the Tagus.

Tai'lor-Bird, a small bird about the size of a warbler, living in India, Ceylon and southern China. There are about seven species. The common tailor-bird is olive-green above and yellowish white underneath, with a pale, brick-red crown. In making its nest, leaves at the end of a twig are sewed together, or sometimes the edges of one large leaf are united. The bill is used as a needle, and fibers and grass are used as threads. This habit gives its name of tailor-bird. The united leaves do not form the nest, but merely are a receptacle for it. The nest proper is made of wool and vegetable-fibers and is lined with hair.

NEST OF THE TAILOR-BIRD

Taine, Hippolyte Adolphe, a well-known French critic, was born at Vouziers, France, April 21, 1828. He studied at Bourbon College, and in 1864 was made professor of the history and æsthetics of art in the school of arts. One of his first essays was crowned by the French Academy. Among his most important works is *The History of English Literature*, a clear and valuable criticism written in brilliant style. In 1871 the University of Oxford conferred the honorary LL.D., and in 1887 he was elected to membership in the French Academy. His other writings embrace *Journey in Italy*, *Journey to the Pyrenees*, *The Old Régime*, *Notes on England* and *The Ideal in Art*. He died at Paris, March 5, 1893.

Tai-Pings, the name given to the Chinese rebels who rose in 1850 and laid waste some of the best provinces of China. The capture of Pekin by French and English troops in 1860, followed by a treaty giving foreign merchants valuable privileges, made it to the interest of the American, French and English governments to re-establish order in China. Ward, an American citizen, who had taken service under the Chinese emperor, showed a remarkable talent for disciplining irregular troops, and was the chief means of the success of the imperial forces in defeating the rebels at Shanghai in 1860 and 1862. In this year Ward was killed, and "Chinese" Gordon was placed in command of his force, which became famous as Gordon's brigade. The Tai-Pings were defeated in over 16 engagements, and in 1864 almost every important city held by them was captured. The rebellion, however, was not stamped out until 1867. See CHINESE EMPIRE.

Tait, Peter Guthrie, an eminent Scotch physicist, was born at Dalkeith, April 28, 1831. He was educated at Edinburgh Academy and University and, later, at St.

Peter's College, Cambridge, England, where he graduated as senior wrangler and first Smith-prizeman. In 1852 he was appointed a fellow of Peterhouse; and in 1854 professor of mathematics in Queen's College, Belfast; but after 1860 he was professor of natural philosophy in Edinburgh. Few men ever exercised more thoroughly healthful influence on the teaching of physics than did Tait. At the same time he set a wholesome example to students and instructors by a very important series of contributions to knowledge. As evidence of this, witness the two quarto volumes of his *Scientific Papers* published by the Cambridge Press. Among his other important publications may be mentioned *Dynamics of a Particle; Quaternions; Recent Advances in Physical Science;* Thomson and Tait's *Natural Philosophy;* and text-books covering his university lectures. He died at Edinburgh on July 4, 1901.

Taj-Mahal (*tāzh-ma-hāl'*), a costly tomb built in Agra, India, by Jehan, the Mogul emperor as a burial-place for Noor Mahal, his favorite wife. It is said to have cost $4,000,000, and building it employed 20,000 workmen for 22 years. Facing Jumna River, where tall cypresses lead to a splendid park in the background, rises the loveliest monument of man's skill combined with nature's material. It is of white marble, 100 feet long and wide and 200 high. It is an eight-sided palace resting on a marble terrace, which is supported by a terrace of red sandstone. A dome flanked by cupolas surmounts the building and minarets rise from the four corners of the marble terrace. Inside and outside are mosaics of precious stones and beautiful tracery. The whole Koran is written in precious stones on the walls This tomb of tombs has been described by travelers as a "glimpse of Paradise." The Taj-Mahal, where Shah Jehan's own remains also rest, appears more like a palace of the frost-king than a building of alabaster and marble. In the sunlight the great dome seems to float above it like a silken balloon, and the minarets resemble exquisite ivory carvings of feathery lightness. Within, beneath the dome, is a tall circular screen of marble lace, 60 feet around, which encloses the tombs covered with carved inscriptions thickly jeweled. The only light which reaches this heart of the Taj is filtered through the delicate meshes of the screen. A well-known writer says concerning the echo: "The dome receives all sounds within its silvery crucible, transforms them into purest harmony, and then sends them down again as if the upper space were tenanted by a celestial choir chanting an endless requiem."

Yet this marvelous mausoleum is but one among many specimens of Mogul art. The Mogul empire in India existed between 1526 and 1857, when the fashion of extravagant architecture reached its height. Among the great Moguls one should remember Babar the founder; Akbar (*q. v.*) the ruler; and Jehan (*q. v.*) the master-builder. So large were the stones of the splendid structures in comparison with the small and delicate patterns carved upon them, that the world declares that these people "built like giants and finished like jewelers." Among their other works are a mosque at Futtehpore Sikri and a tomb at Secundra by Akbar; the Pearl Mosque; and the Palace at Delhi built by Jehan. The Moguls borrowed characteristics or marks in construction from their Persian and Arabic neighbors. Some of these are the bulbous or turnip-shaped domes grouped about a central, large dome of the same shape; the curving, pointed arch called an ogee; and arabesque as well as floral patterns in their carving. The high portals to the buildings curve inwards, forming an inside porch with three doors elaborately carved to match the rows of pillars, pointed arches and windows. Slender towers called minarets connect the buildings with balustrades, and are charming view-points from which one may look down upon the courts where flowers bloom and fountains play, thus repeating the beauty of the gardens. The stone or brick walls are faced inside and out, usually by marble slabs; and are often inlaid with onyx, jasper, carnelian and other semi-precious stones, which are cemented into cuttings in the marble and in wonderful patterns of vines and flowers. The love of gems for decoration was shown in the making of Jehan's famous peacock-throne, now in Persia. The back of the seat is two golden peacocks set with rubies, sapphires, emeralds and diamonds, with a pearl-fringed canopy above. This was placed in a private audience-hall overhanging the sea. On the walls of the gorgeous room were these words: "If there be a paradise on earth, it is this." Consult Fergusson's *History of Indian Architecture,* Gordon Hearn's *Seven Cities;* J. L. Stoddard's *India;* and the models in the London Museum of Indian Curiosities. See ARCHITECTURE, FINE ARTS and MONGOLS.

Talc (*tălk*), a mineral consisting of magnesium silicate containing a little water, much like mica in appearance and easily divided into thin flakes, which can be bent and are transparent but are not elastic like mica-flakes. It, however, is much softer than mica, can be readily scratched by the finger-nail, and feels greasy when rubbed with the fingers. It is silvery white, greenish white, or green with a pearly luster. It is found in crystalline and in masses. The massive varieties cannot always be separated into flakes. Massive talc, called soapstone, steatite, potstone and French chalk, is quarried in large quantities in Vermont, New Hampshire, Massachusetts, Maryland,

Virginia and North Carolina, and in smaller quantities in other states. Soapstone in slabs is largely used for wash-tubs and for tables in chemical laboratories. It does not crack when exposed to moderate heat, as slate usually does.

Tal'ent, anciently a weight and a denomination of money, varying at different periods and among different nations, as the Greeks, Babylonians and Phœnicians. The Greek talent of weight contained 60 *minæ* or about 80 pounds avoirdupois; the monetary talent among the Greeks was a talent's weight of silver or gold — the monetary unit. The Attic talent of silver, which weighed about 58 pounds avoirdupois, was of the value of about $1,200. Among the Hebrews a talent of silver was equivalent to 3,000 shekels (about $1,700 or $1,800); the gold talent was equal to 10,000 gold shekels — the value being determined by the current price or purchasing power of the metal of which it was weighed, whether of silver or of gold.

Tal'isman, The, a novel by Scott, was published with *The Betrothed* in June of 1825, and written in the true spirit of old romance. Most of its incidents are fictitious, though the ideals of the crusading times are made to live again. The spirit of the Holy Land vies with that of the Scottish border. The action takes place in Palestine, the title being derived from an amulet or charmed stone with which Saladin cures King Richard Cœur de Leon in his illness. This he afterwards presents to Sir Kenneth, the hero, finally discovered to be the prince royal of Scotland on his marriage with Edith the sister of Richard. *The Talisman* has always been a favorite with the young, It glows with bright impossibilities, even to a fault.

Tal'lade'ga, Ala., county-seat of Talladega County, on the Southern, the Louisville and Nashville and the Atlanta, Birmingham & Atlantic railroads, 50 miles southeast of Birmingham. Here in 1813 was fought a battle between the Creek Indians and an American force under Andrew Jackson. The city is the seat of Talladega College (Cong.) for colored students, of the Orphan's Home (Presb.), and of state schools for the deaf, dumb and blind. Its industries embrace the manufacture of cotton, knitted goods, chemicals, fertilizers, cottonseed-oil, furniture, cordage, oil, ice brick and marble products. Population, 5,824.

Tallahassee (*tăl lă-hăs'sē*), **Fla.,** the capital of the state and county-seat of Leon County, stands on high ground, 21 miles north of the Gulf of Mexico. The capitol was begun in 1826. There are railroad-car and machine shops, a cotton-factory, novelty works and cigar-factories. The leading educational institutions located here are Florida State College for women, which has a normal department and a fine public-school system. The old Spanish fort of San Louis is near by, and 16 miles away is the well-known and beautiful spring Wakulla. The town is noted for its flowers. Tallahassee was made the territorial capital in 1822, but was not laid out until 1824. Population, 5,018.

Talleyrand (*tăl'lĭ-rănd*) **de Perigord, Charles Maurice,** Prince, a famous French diplomatist, was born at Paris, Feb. 14, 1754. His father, Count of Talleyrand, would have had him enter the army, had he not been accidentally lamed when a child. So he became a priest and rose to be bishop of Autun. As a member of the national assembly of 1789 he was a hearty friend of Mirabeau, and at the feast of the federation in the next year he headed a procession of 200 priests wearing the national colors over their white robes and performed mass on the altar set up in *Champ de Mars*. After the fall of Louis XVI Talleyrand went to England and then to the United States, where he reaped a fortune by speculation. He went back to France as soon as his name was crossed off the list of exiles, and in 1797, as the newly appointed minister of foreign affairs, welcomed Napoleon on his return from his famous Italian campaign. He greatly helped Napoleon to seize absolute power, and as his minister of foreign affairs became the ablest diplomat in Europe. An estrangement, however, separated the coworkers, Talleyrand resigning in 1807. To his intrigues was chiefly due Napoleon's fall in 1814, and for this treachery he was for the third time made foreign minister by Louis XVIII. At Napoleon's return from Elba he was in Austria as French commissioner to the Congress of Vienna, but after Waterloo he accompanied the king to Paris. He soon resigned his office, but retained great influence, men of all parties thronging his salon. He came to the front again after the revolution of 1830, as ambassador to England. His personal *Memoirs* and his *Memoir on the Commercial Relations of the United States* are the most valuable of his writings. He died on May 20, 1838.

Tallien (*tă-lyăn'*), **Jean Lambert,** a French revolutionist, was born at Paris in 1769. He first came to the front in 1792 as editor of a Jacobin newspaper, which gave him great influence. As secretary of the commune he helped on the September massacres. He was a supporter of Marat, and was eager for the death of Louis XVI and the Girondists. In 1793 he was sent to Bordeaux to root out this party, where he gained lasting infamy by his reckless cruelty. In 1794 he came back to Paris to become president of the Convention; and, to save himself from the attacks of Robespierre, he organized the destruction of the Terrorists, though he had himself perhaps been more guilty than they. Tallien now became one of the most influential men, but his past crimes could not be forgiven and in 1798

he was forced to leave the council of 300. He died on Nov. 16, 1820.

Talmage (*tăl'mĭj*), **Thomas De Witt,** American Presbyterian clergyman and lecturer, was born at Bound Brook, N. J., Jan. 7, 1832; was educated at the University of the City of New York; and graduated from the Theological Seminary of New Brunswick, N. J. He was pastor successively of Reformed Dutch churches at Belleville (N. J.), Syracuse (N. Y.) and Philadelphia (Pa.), and from 1869 to 1874 he was in charge of Central Presbyterian Church at Brooklyn, N. Y. In 1875 he accepted a call to First Presbyterian Church, Washington, D. C. He edited *The Christian Herald*, and was also editorially connected with *The Christian at Work*, *The Advance* and Frank Leslie's *Sunday Magazine*. Besides many volumes of lectures and sermons he published *Around the Tea-Table*, *The Marriage-Ring*, *Old Wells Dug Out*, *The Practical Life*, *Every-day Religion*, *From Manger to Throne*, *Woman* and *Sunbeams*. He died on Apr. 12, 1902.

Tal'mud. See LITERATURE, JEWISH.

Tam-a-mack. See LENÂPE.

Tamarind, a tree cultivated in India for its fine shade as well as for its fruit. It also is grown (though of the wild type) in other tropical countries, as Florida and the West Indies. It is known as the Indian date. Its long many-seeded pods containing an acid pulp, which is used medicinally and as a pleasant drink, and also as an ingredient in curries and in making sherbet. The tree has a hard wood of value in cabinet-work, and is exceedingly handsome.

Tambourine (*tăm-bŏŏn-ēn'*), a very old musical instrument, used by Basques, Italians and Gypsies. It is a piece of parchment stretched on a hoop furnished with little bells, and is sounded by the hand, fingers or elbow. It is used to accompany singing and dancing, and has been adopted by the Salvation Army.

Tamerlane. See TIMUR.

Tammany Society, the most powerful political club in the world, is an organization of the Democratic party in New York City, and was founded in 1789. It was nearly ruined at the time when the city and it were under control of the Tweed ring. It has been more or less opposed by outside Democrats in New York at various times, but to-day is supreme in the councils of the party in New York. See TWEED.

Tampa Bay, an inlet of the Gulf of Mexico on the western coast of Florida, south of Cedar Keys and north of Charlotte Harbor, on which the city of Tampa is situated. The bay, known also by its old Spanish name of Espiritu Santo, is divided in its upper waters by a peninsula into Old Tampa Bay and Hillsboro Bay. Its length is between 35 and 40 miles, while its breadth it varies from six to 14, with a depth of 22 feet at its main entrance, which is protected from the Gulf by a number of keys or low islets.

Tampa, Fla., a thriving city and port of entry at the head of Tampa Bay and the mouth of Hillsboro River, the capital of Hillsboro County, 30 miles from the Gulf of Mexico, in western central Florida. It has a spacious harbor, and has steamship connection with Mobile, New Orleans, New York, Havana and Key West. It has railway connection with the Florida Central and Peninsula, the Savannah, Florida and Western and other railroads. Its chief industry is the manufacture of cigars; fruit-culture, the fishing-trade and the shipment of phosphate are other occupations of its people. Population 37,782.

Tampico (*tăm-pē'kō*), a Mexican seaport in the State of Tamaulipas, on the Panuco, five miles from the Gulf of Mexico and 235 miles northwest of Vera Cruz. Its harbor has a dangerous bar, and is unsafe. Trade is carried on chiefly with New York, New Orleans and Liverpool. Population 12,000.

Tanager (*tăn'ā-jēr*), the name for members of a large family of birds mainly confined to tropical America. There are about 350 species. Two forms abound in the eastern and southern United States. The scarlet tanager is our most brilliantly colored bird, and is familiar to most people who live within its range. It is a little more than seven inches long; the male, during the breeding period, is bright red with black wings and tail; the female is clear olive-green above and greenish yellow below. After the nesting-period the male becomes colored like the female. They inhabit both high and low woods and usually nest in oaks. Our other tanager is the summer redbird, a more southern species, which ranges north to New Jersey and southern Illinois. The male is bright rose-red throughout, with the wings a little dusky. The female is dull olive above and yellow below.

Tananarivo (*tä-nä'nä-rē-vō'*) or **Antananarivo,** the capital of Madagascar (*q. v.*), is built on a long hill 7,000 feet above the sea. The houses are of wood or bamboo, roofed with bamboo or mats. The habits and ways of the people have been greatly bettered under the teaching of missionaries. Population 65,000.

Tancred (*tăn'krĕd*), an Italian prince, was born in 1078. He joined the crusaders under Bohemond, his cousin, the son of Robert Guiscard, the crusader. He fought bravely at the siege of Nicæa in 1097, and in the battle of Dorylæum saved the Christian army from being cut to pieces. In the massacre which followed the capture of Jerusalem, whose walls he was one of the first to mount, he alone had any mercy for the conquered, in whose behalf he risked his own life. Tancred defeated the advance guard of the sultan of Egypt, and had a great share in the capture of Ascalon. After tak-

ing Tiberias he was made prince of the city. He defended Antioch against great odds, whose governor (his cousin Bohemond) had left to raise recruits in the west. Tancred carried his arms as far as Tripoli, and succeeded in driving the Saracens out of Syria. He died at Antioch in 1112. He is one of the leading heroes of Tasso's famous poem of *Jerusalem Delivered*.

Taney (*tâ'nĭ*), **Roger Brooke,** chief-justice of the United States, was born in Calvert County, Md., March 17, 1777. He graduated at Dickinson College, Pennsylvania, studied law, and took part in politics as a Federalist. He afterwards became a Jackson Democrat, and was made attorney-general in President Jackson's cabinet in 1831. Two years later he was appointed secretary of the treasury, as his chief knew that he could be depended upon to remove the government deposits from the United States Bank to local banks, the refusal to do which had caused the dismissal of Secretary Duane. Taney succeeded the great Marshall as chief-justice of the supreme court in 1837. His most famous decision was that in the Dred-Scott case in 1857, in which Scott, a negro, brought suit to gain his freedom on the ground of his having been carried by his master from the slave-state of Missouri into free territory. The decision, denying the right of citizenship to negroes and the authority of Congress to keep slavery out of the territories, caused greater excitement throughout the country than any decision of the supreme court before or since. Chief-Justice Taney died at Washington, D. C., Oct. 12, 1864. See *Life* by Prof. Samuel Tyler.

Tanganyika (*tăn-găn-yē'kā*), meaning the meeting place of waters, is the name of a great Central African lake discovered by Burton and Speke in 1858. It lies south of Lakes Albert Edward and Albert and northwest of Lake Nyasa; is about 400 miles long and from 10 to 60 wide; and is about 2,700 feet above the ocean. A wide bay at the southern end was named Lake Liemba by Livingstone. The eastern coast is hilly, and the western coast mountainous and covered with forests. There are many small rivers flowing into it, and the Lukuga flows from it into the Kongo. Ujiji, where Stanley found Livingstone, is the principal town on the lake. Telegraph lines now run through the Nyasan protectorate to Tanganyika.

Tangier (*tăn-jēr'*), a seaport of Morocco near the western entrance of the Strait of Gibraltar, is built on high ground and is defended by forts. It is the principal center of commerce in Morocco, has important trade with Europe, doing a foreign business of $4,000,000 yearly, and is the residence of consuls and the diplomatic corps sent to Morocco. Tangier, once called *Tangis*, is an old city, and is thought to have been founded by the Carthaginians. It became the capital of a Roman province, was held by the Portuguese for nearly two centuries, and in 1662 was presented to Charles II of England as part of the dowry of Catherine of Braganza. England held it for 22 years. In 1844 it was bombarded by the French. Population about 35,000.

Tanjore (*tăn-jōr'*), an Indian city, 180 miles southwest of Madras. There are two strong forts; in the larger one is the rajah's palace, in the smaller, one of the finest of Indian pagodas. Silk, muslin and cotton cloths are manufactured. Tanjore was first the capital of a Hindu state of the same name, which was conquered by the Mahrattas, and fell into the hands of the British about 1800. Population 57,870.

Tannhäuser (*tän'hoi-zĕr*), a famous knight of the middle ages, who, according to the German legend, goes to Venusberg and enters the cave-palace to behold the wonders of Lady Venus and her court. Conscience-smitten at the life of careless pleasure he lives here, he betakes himself to Rome to crave forgiveness of the pope. The pope, however, holding a wand in his hand tells Tannhäuser that he can as little get God's forgiveness as that dry wand can become green again. In despair the knight goes back to Lady Venus in the mountain. But three days afterwards the wand begins to sprout and bears green leaves, and the pope at once sends messengers to every country, but in vain — Tannhäuser can nowhere be found. Such is the story as told in the popular ballad once sung all over Germany. On this *saga* Wagner based his well-known opera of *Tannhäuser*.

Tannhäuser and the Singers' Contest at the Wartburg is the title of a music drama by Richard Wagner, who wrote both words and music. First performed at Dresden, Oct. 20, 1845. The conception of the opera occurred during a visit of Wagner to the castle of Wartburg, in the Thuringian Valley, in the spring of 1842. The castle was the traditional scene of the contests between the *minnesinger* and the knightly poets, whom the landgraves of the 13th century assembled for tournaments of song. Schumann mentions the opera as one "which cannot be spoken of briefly," adding that "it certainly has an appearance of genius."

Tan'nin or **Tan'nic Ac'id** is of great importance in tanning leather. The chief source of tannin is oak-bark, though in America hemlock-bark is much used, while the mimosa or wattle-barks of Australia are important. However, tannin is found in the bark and leaves of most forest-trees, as the elm, willow, horse-chestnut, and pine, and in many fruit-trees as the pear and plum. Coffee, tea and, especially, Paraguay tea also contain tannin.

Tan'ning. See LEATHER.

Tantalus (*tăn'tȧ-lŭs*), noted in Greek myth for the punishment he received in the lower world. He was the son of Zeus, and for making known the counsels of his divine father or for other reasons, — the stories differ, — he was in the lower world stricken with a fearful thirst, and had to stand up to the chin in a lake, the waters of which escaped him whenever he tried to drink. Clusters of fruit hung over his head, but missed his grasp whenever he reached for them; at the same time he was in terror lest a huge rock, hung over his head and ever threatening to fall should crush him. From Tantalus comes "tantalize."

Tapajos (*tä'pȧ-zhōsh'*), an important river of Brazil and a branch of the Amazon, is formed by the junction of the Arinos and the Juruena. After flowing north for over 1,100 miles, the Tapajos falls into the Amazon 20 miles below the town of Santarem. Its upper waters are only 18 miles from those of the Paraguay There is one fall of 30 feet, but otherwise the river is navigable for the greater part of its length.

Tap'estry, an ornamental figured cloth, used for lining walls and covering furniture. The Jews and Egyptians were skillful tapestry workers. In France the ladies of the nobility used their needles in making beautiful tapestry for the adornment of churches and monasteries. About the 9th century this work began to be done by the loom. The Flemings excelled in tapestry-weaving, and in the 14th and 15th centuries the factories of Brussels, Bruges, Antwerp, Lille and Valenciennes were noted, and in the next century the factory at Fontainebleau. The art of weaving tapestry was introduced into England near the end of the reign of Henry VIII. A famous and very old factory is that of the Gobelins at Paris. So slow is the work that 39 square inches are considered a fair year's work for one artist. Perhaps the most remarkable piece made by hand is the Bayeux tapestry (*q. v.*), which commemorates the Norman Conquest. It is 214 feet long, and is of great historical value, as it shows the old Norman costumes in great detail, and also pictures events of the conquest not mentioned by any chronicler.

Tap'io'ca, a farinaceous substance prepared from cassava-meal, which, while moist or damp, has been heated for the purpose of drying it on hot plates. By this treatment the starch-grains swell, many of them burst, and the whole agglomerates in small, irregular masses or lumps. In boiling water it swells and forms a viscous jelly-like mass.

Ta'pir, the name for several thick-skinned mammals with elongated snouts, inhabiting India, the adjacent Malayan islands and Central and South America. The tapirs, united with the rhinoceroses and horses, form a group of odd-toed ungulates or hoofed animals, all other hoofed animals having an even number of toes. The tapirs have three toes behind and four on the front feet, but only three are used. The Old-World tapirs are larger than those of the New World, the common Indian form being eight feet long and thirty-nine inches high at the shoulders. The legs and the front part of the body are black, but the sides and back of the hinder portion are white. Those of the New World are brown or blackish when adult. The common South-American form is about seven feet long, and inhabits thickly wooded districts as far as the Andes. It is there replaced by a mountain form living at altitudes of 7,000 and 8,000 feet. There are two species in Central America whose habits are little known. Tapirs commonly feed on young leaves, shoots and fruits. Those of South America are destructive to plantations. They are hunted for their flesh and hides.

MALAY TAPIR

Tar, an impure turpentine got by burning the wood of pine and cone-bearing trees and by distilling peat, bituminous coal and shale. The early Greeks made tar and the people living along the Gulf of Bothnia now make it in the same way, by burning wood in a heap covered with turf, much as charcoal is made. In Sweden trees are partly stripped of their bark, and, when cut down some six years later, are found much richer in resinous matter. In the United States most wood-tar comes from North Carolina, though it is also made in other parts of the country. It is usually made of pitch-pine, and is burned in tar-kilns, which are piles of pine-billets in the form of an inverted cone, covered with logs, green twigs and earth. The kiln is lighted at the top, and the tar runs out through a wooden spout at the bottom.

Coal-tar is made when illuminating gas is manufactured from bituminous coal. For a long time this tar was a mere waste-product, but now it is widely used as a covering to protect iron-work from the weather: and the pitch is used for pavements, roof-covering etc. By distilling coal-tar, benzine or benzol and other volatile products are obtained, which are very valuable as raw materials in the preparation of artificial dyes.

Tarantula (*tȧ-răn'tū-lȧ*), the name commonly applied to any large, running spider of warm countries. The true tarantula is

a native of southern Europe, and got its name from being common in the neighborhood of Taranto, Italy. The bite was considered very dangerous, and was fabled to produce an epilepsy which could be cured only by dancing, until exhausted, to lively music of a particular kind. The tarantulas, using the name in its wide meaning, are dark-colored, hairy spiders, with mandibles that work up and down, instead of sideways, as is the direction in most other spiders. They live under rocks and in holes which they make in the ground and line with silk. They do not spin webs, but rush upon passing insects and other prey.

Tar'bell, Ida Minerva. A noted American writer upon historical and economic subjects. Born in Erie County, Pennsylvania, on Nov. 5, 1857, she grew up in the oil-region. She graduated with honors from Titusville High School and Allegheny College, and studied in Paris, 1891–4, at the Sorbonne and the College of France where she began to make her mark as an historical writer. She for eight years was associate-editor of *The Chautauquan*, later was on the editorial staff of *McClure's Magazine*, and is now associate editor of the *American Magazine*. Among her writings are *Short Life of Napoleon Bonaparte; Life of Madam Roland; Life of Abraham Lincoln;* and *History of the Standard Oil Company*. She has written extensively for magazines.

Tarifa (*tä-rē'fä*), a famous Spanish city, is 25 miles southeast of Cape Trafalgar. It has old walls, towers, a fortress and a Moorish castle. Tarifa was founded by the Moors, who forced all vessels passing through the Strait of Gibraltar to pay tribute at this town. From this fact comes our word "tariff." The Castilians captured Tarifa in 1292 and held it in the face of several sieges by the Moors. The French besieged it in vain in 1811, but captured it in 1823. Population 11,725.

Tar'iff. A tax on imports. The following summary of United States tariff legislation gives the date, purpose and character of each measure and the name by which it is known:

1789. Hamilton (*q. v.*). Object, to put money into country's empty treasury. Articles listed 51; duties 5 to 15%; amended six times (1789-1804).

1812. Lowndes-Calhoun. First to protect as well as raise revenue. Many manufactures had sprung up during the war. Duties 7½ to 33% ad valorem.

1824. Clay (*q. v.*) and "Tariff of Abominations" (1828), both of which further raised duties. Average of latter 37%.

1832. The "Modifying" tariff. Endeavored to readjust duties more equally.

1833. "Compromise" tariff. Reduced duties ⅓ yearly down to uniform rate of 20%.

1842: Polk-Walker. For revenue only. Duties reduced by 1857 to average of 15.66%.

1861. Morrill, Protective. Doubled existing duties.

1890. McKinley. Increased duties 60% but enlarged free list and empowered president to remove from free list certain products of any country charging unreasonable duties on U. S. products. (Reciprocity clause.)

1894. Wilson. Removed duties on raw materials, lowered duties generally and provided for income tax (*q. v.*). Latter declared unconstitutional.

1896. Dingley. Rates somewhat lower than McKinley.

1910. Payne-Aldrich. Made some reductions but Democrats won on platform condemning the act as failing to fulfill Republican promise of reduction. (See TAFT.)

THE TARIFF OF 1913.

The tariff of 1913 made 938 reductions of duty, 86 increases and left 307 rates unchanged. Reductions and removals of duty affect raw material, machinery and manufactured goods including cotton, woolen, linen and silk, sugar and other food stuffs. The average rate on cotton goods was cut from over 45% to about 30%. The duty on wool was removed and on woolen cloth fixed at the uniform rate of 35% ad valorem as against 90 to 152%; on clothing at 35% as compared with 75%. Comparative rates (ad valorem) on woolen products are as follows: 35-90 to 152; clothing 35-75; flannels 25 to 30-75 to 110; blankets, 25-68 to 200%. Agricultural products 15-29, and all food animals are admitted free. Free admission of sugar after May 1, 1916; immediate free admission from the Philippine Islands and reduction of about one-fourth after March, 1914. Leather and tanning extracts are admitted free; also agricultural machinery and implements of every kind. Wood and woodenware and furniture reductions, all the way from 25 to 60%. Original works of art on free list. The increase affects mostly articles of luxury.

Tark'ington, Newton Booth, American novelist, was born at Indianapolis, Ind., on July 29, 1869, and graduated at Princeton in 1893. When, later, pursuing a business career, he discovered gifts in himself as a writer, especially of realistic and romantic stories. His first notable work, *The Gentleman from Indiana*, met with instant success, and was followed in 1900 by *Monsieur Beaucaire*, a novelette subsequently dramatized and produced on the stage by Richard Mansfield. In 1902 appeared *The Two Vanrevels*, in 1903 *Cherry*, in 1905 *The Conquest of Canaan* and *The Beautiful Lady*, besides *In the Arena: Tales of Political Life*. In 1902 he entered practical politics as a member of the Indiana legislature.

Tarpeian Rock (*tär-pē'yan*), at first the name given to the whole Capitoline Hill in Rome, but afterwards only to the southern part of it. Tarpeia, daughter of the governor

of the Roman citadel on the Capitoline, covetous of the golden bracelets worn by the Sabine soldiers and tempted by their offer to give her what they wore on their left arms, opened the gate of the fortress to the Sabine king. Keeping their promise to the letter, the soldiers crushed Tarpeia to death beneath their shields, which were carried on the left arm, and she was buried on the part of the hill which bears her name. Afterwards traitors were often hurled from the Tarpeian rock.

Tar'pon or **Tar'pum**, a prized fish-food, akin to the herring, found off the Florida coast and in the Gulf of Mexico. This marine fish usually is six or more feet in length, and catching it furnishes exciting sport for fishermen with rod and reel. It has large, silvery scales, used in fancy-work. Another variety of the fish is found in Indian waters.

Tar'quin, the name of two kings of Rome. According to the story, Lucumo, the son of a Corinthian nobleman who had settled in Etruria, resolved to improve his fortune by going to Rome. On the way an eagle swooped down and snatching off his cap carried it high into the air, and then, descending, placed it on his head again. His wife, who was skilled in augury, prophesied from this omen the highest honors for her husband, who took the name of Tarquin. He became the guardian of the children of King Ancus Marcius, and was chosen to succeed him on the throne. His reign (B. C. 616–578) was a glorious one. He waged successful war against the Latins, Sabines and Etruscans, built Roman sewers which remain to this day, laid out Circus Maximus and the Forum, began the building of the Capitol, and instituted the great Roman games. He was, however, murdered after a reign of 38 years, through the influence of the sons of Ancus Marcius. His son, Tarquin the Proud, in 534 B. C. murdered King Servius Tullius, his father-in-law, and usurped the crown. He ruled ably though tyrannically, and made Rome the acknowledged head of Latium. But his heavy taxes and, especially, his persecution of the popular party, which had supported Servius Tullius, caused wide-spread discontent. At the same time a fearful omen encouraged his enemies; from the altar in the royal palace a serpent crept forth and devoured the entrails of the victim. At last came the rape of Lucretia by Sextus, the king's son. The senate deposed the tyrant, the army revolted against him, and he was forced to flee. Three attempts to reinstate him failed, and Tarquin's reign was followed by a republic at Rome. He died in B. C. 510 or 495. See ROMAN EMPIRE.

Tar'rytown, N. Y., an attractive and historic village in Westchester County, on the eastern bank of the Hudson, opposite Nyack, and on the New York Central and Hudson River Railroad, 25 miles north of New York City. It is situated on Tappan Bay, above Irvington and below Sing Sing, and has many fine residences, besides schools and churches, including a Dutch church which dates from the close of the 17th century. Near by (at Irvington) is Sunnyside, the home of Washington Irving, where he sleeps in Tarrytown churchyard, rendered famous as the site of Irving's *Legend of Sleepy Hollow*. The village is also historically known as the place where Major André (*q. v.*) was captured. Tarrytown had an early settlement, though incorporated as late as 1870. Here are Irving Institute, Tarrytown Lyceum, the Catholic Institution of Mercy, a public library and industrial establishments and drill-works. Population 5,600.

Tar'sus, a city of Asiatic Turkey, on the Cydnus, about ten miles from the Mediterranean. It is built of stone, and is surrounded by a rich country. There are mosques, caravansaries and public baths. Wheat, barley, cotton and gall-nuts are exported. Tarsus is said to have been founded by Sardanapalus. Alexander captured it and it became a large and important city under the Romans. Tarsus is noted as the birthplace of St. Paul (*q. v.*). Population about 20,000, former population 100,000.

Tartar'ic Ac'id is found in grapes, tamarinds, pineapples and several other fruits, usually in combination with potassium. It is generally got from argol, which is produced during the fermentation of grapes. The acid is usually seen as colorless, transparent crystals, soluble in water and alcohol. The crystals, when gently warmed, become strongly electric. Tartaric acid is largely used in calico-printing and dyeing, for making lemonade and in drinks and lozenges as a medicine. The acid potassium tartrate, called cream of tartar, is extensively employed as an ingredient of baking-powders.

Tar'tars, in the widest sense include all the tribes living in the tablelands of central and northern Asia who are not of Aryan blood, that is, the Tartars proper, the Kirghiz, the Kalmucks, the Manchu Tartars, the Mongols proper and the Tungusians. In a narrower sense they comprise the Mongolian or Turanian people of Turkestan (*q. v.*). These tribes are the wandering Kirghiz, the Uzbegs, who are the ruling class, the Kiptchaks, the Buddhist Kalmucks of eastern Turkestan and many other tribes. In central Asia the words Turk and Tartar are used interchangeably to mean Mongolian. Tartar tribes, as distinct from Turks, formed the bulk of the great Mongolian migrations from the 4th to the 10th century, which planted the Tartar in southern Russia. Tartars and Turks (*q. v.*)

made up the hordes which followed Genghis Khan (*q. v.*) and Timur (*q. v.*).

Tar'tary, the name given formerly to a broad belt of territory reaching from the Seas of Japan and Okhotsk to the Caspian or perhaps to the Don. Khiva was formerly called Independent Tartary; and the Crimea was called Little Tartary, also Crim Tartary, from the name of the tribe which settled there in the 13th century. The name is applied now, if at all, to the Turkestani region.

Taschereau (*ta'sh'-rō'*), **His Eminence Elezear Alexander,** the first Canadian cardinal, was born at Ste. Marie-de-la-Beauce, Quebec, Feb. 17, 1820, his father being a judge of the queen's bench and his mother the daughter of the speaker of the first legislative assembly of Canada. He was educated at Quebec and Grand Seminaries, ordained in 1842, for four years a professor, later director and at last superior of Grand Seminary, and in 1860 director of Laval University as well. Vicar-general of the archdiocese of Quebec in 1863, he was consecrated archbishop in 1871 and elevated to the cardinalate in 1886. He died in Quebec, April 12, 1898.

Taschereau, Hon. Sir Henry E., was born in 1836. He was called to the bar of Quebec in 1857, and was a member of the Quebec legislature from 1861 to 1867. He was appointed a judge of the superior court of the province in 1871 and in 1878 a judge of the supreme court of Canada. He has written several textbooks on law. He became chief-justice of the court, and recently resigned.

Tashkend (*tăsh'kĕnd'*), a city of Russian Turkestan (*q. v.*), on Saralka River. It stands in a rich plain, and is surrounded by a wall 12 miles around, which is pierced by 12 gates. The houses of mud, thatched with reeds, are scattered among gardens and vineyards. A fortified castle, which is the home of the governor, mosques, colleges, old temples and a bazar are the chief buildings. Gunpowder, silk, cottongoods and iron are manufactured. A large trade is carried on with Bokhara, Mongolia and the Russian provinces of Orenburg and Petropavlovsk. Tashkend is an important military point and was long coveted by the Russians, who captured it in 1854. Population 155,673. See Vambery's *Travels in Central Asia.*

Tasmania (*tăz-mā'nĭ-ȧ*), (formerly known as Van Diemen's Land), is an island lying south of Victoria, Australia, and separated from it by Bass Strait. It is one of the original states of the Commonwealth of Australia (*q. v.*). The colony is a British possession, and at the beginning of the century was a penal settlement. Transportation of criminals to it ceased in 1853. Its area is 26,385 square miles, including Macquarie, divided into 18 counties. The aborigines are extinct. The capital is Hobart, on the south of the island, with a population of 24,655. The other chief town is Launceston (18,077). The principal occupations are agriculture and stock-raising; wool, wheat, hay and oats being the chief exports. Fruit is successfully cultivated, especially apples and pears, which in size, appearance and variety surpass those of Britain. The climate is healthy and temperate. The island contains tin, coal, gold and silver. Education is unsectarian, and compulsory for all children between seven and fourteen. Government is exercised by a responsible ministry, with a parliament consisting of two chambers. A resident governor represents the crown. Population about 190,000.

Tasso, Torquato (*tăs'sō, tor-kwā'to*), an Italian poet, was born at Sorrento, March 11, 1544. His father, also a poet, lived in exile, and Torquato was brought up by his mother, and went to school to the Jesuits till his tenth year, when he joined his father at Rome. He passed some years in study and in helping his father by copying and correcting, when he left for Padua to study law, where he wrote *Rinaldo*, his first poem, and, after a course of philosophy at Bologna, returned to become a member of a literary academy established by one of his friends. While at the court of Alphonso II, duke of Ferrara, in 1575, Tasso finished his masterpiece, *Jerusalem Delivered*, but rashly sent it to a society of scholars, critics and churchmen at Rome, instead of publishing it at once. Their criticisms drove him to madness. He believed he had been denounced to the Inquisition and one evening in 1577 he drew his dagger to stab a servant, whom he fancied to be one of his secret enemies. He was imprisoned, but escaped to his birthplace, where he recovered his reason. Two visits to Ferrara were followed by two returns of madness, after one of which he suffered an imprisonment of seven years, being set free in 1586. In 1595 the excitement of visiting Rome to be crowned a poet — the same honor which had been bestowed on Petrarch — caused an illness from which he died on April 25. See Milman's *Life of Torquato Tasso.*

Taste, the sense by which such properties of substance as sweet, sour, bitter, salt etc. are distinguished. The principal organ of taste is the tongue, especially its sides, base and tip. The soft palate and the arches of the palate also have the sense of taste. The sense of taste is weakened by any great change in temperature, either of heat or cold, as after holding the tongue in ice-water or in very hot water the taste of sugar will not be noticed. It is necessary that bodies to be tasted should be dissolved, so as to come in contact with

the nerves of taste. Any substance which will not dissolve in the fluids of the mouth will be found to be tasteless, and only recognized by the sense of touch in the tongue. Bitters and acids excite sensations of taste in the most diluted forms. One part of quinine in 1,000,000 parts of water can be easily distinguished from pure water. The sense of smell (*q. v.*) is affected by most substances as well as the sense of taste, and taste and smell together form what is called the flavor. The great use of the sense of taste is to direct in the choice of food, and in the lower animals it is even a surer guide than in man. Usually articles that are agreeable to the taste are desirable for food.

Tattoo'ing, a widespread custom among savages of marking the skin with figures by means of slight cuts or punctures and a coloring matter. It is almost universal in the islands of the Pacific. New Zealanders often cover the whole face and sometimes the chest, arms and other parts of the body with tattoo patterns. A boy is tattooed on entering manhood; the operation causes considerable pain but is born unflinchingly A bone, edged with teeth, is dipped in a thick mixture of charcoal and water, and hammered through the skin by means of a piece of wood. The marks last for life, and look black on a brown skin, but are dark-blue on the skin of a European or American. Tattooing seems to have been common among the nations with whom the Jews came in contact, as they were forbidden to practice it. The Bedouin Arabs and many tribes of American Indians tattoo, and sailors all over the world print anchors and other marks on their arms.

Tauchnitz (*touk'nits*), **Karl Christoph Traugott,** a famous German printer and bookseller, was born at Grosspardau, near Leipsic, Germany, in 1761 Bred a printer, he began a small printing-business of his own in Leipsic in 1796. Publishing and type-founding were added, and it became one of the largest establishments of the kind in Germany. In 1809 he began to issue classic works in such fine and cheap editions that they circulated throughout Europe. By offering a prize of a ducat for every error pointed out, he brought out a remarkably correct edition of Homer. In 1816 he introduced stereotyping into Germany and applied it to music, an experiment which had not been tried before. The well-known Tauchnitz edition of English authors, which numbers over 3,700 volumes, was begun in 1842 by his nephew. The older Tauchnitz died in 1836.

Taun'ton, Mass., county-seat of Bristol County, on Taunton River, 35 miles south of Boston. The falls of the river furnish water-power for its many factories. Taunton has long been noted for its manufacture of stoves and printing-presses, brick and iron, and its copper-works are the oldest and largest in the United States. Other products are tacks, machinery, firebrick, crucibles, cotton, flannel, silver-plated ware and solid silverware. Taunton River is noted for its herring and shad fishing. There are a public library, Registry Building, Morton Hospital and the state insane asylum. Several ponds, many shade-trees and the green — a public square — help to beautify the place. There also is a fine bronze statue of Robert Treat Paine, a signer of the Declaration of Independence, occupying a conspicuous place, Taunton being Paine's home. Relics are preserved in Historical Hall, a building owned by the Old Colony Historical Society. Taunton has an excellent public-school system and Bristol Academy, located here, was incorporated in 1792. Taunton was settled in 1638 by a company from Taunton, England. It became a city in 1864. The site was known to the Indians as Cohannet. It was King Philip's favorite hunting-ground, and during King Philip's war it was saved from attack by the king's friendship for one of the citizens. Population 34,259.

Tau'rus, a range of mountains in Asia Minor, which forms the water-shed between the waters flowing into the Mediterranean and those flowing into the Black Sea. There are two divisions of the range, the Taurus on the south and the Anti-Taurus running northeast. Snow-covered mountain-tops are numerous, rising above thick forests that everywhere mantle the mountain sides. The highest peak is Arjish Dagh in the Anti-Taurus range (13,100 feet). Other noted peaks are Bulghar Dagh (11,400 feet), Gok Dagh and Ak Dagh, each 9,800 feet. The principal pass between Syria and Asia Minor, called in early times the Cilician Gates, is formed by the valley of the upper Cydnus.

Tax'es are levied on property and persons for the support of a government. In early times rulers often raised revenues by means of property owned by the government or crown or belonging to the king or prince himself. The possessions of subjects were often confiscated outright, fines were imposed, and in Europe for many years crimes were punishable by the payment of a stated sum of money. The Jews paid taxes mainly in the form of the first fruits of their lands and the firstborn of their flocks, and it was the heavy burden of taxation that caused the revolt of the Ten Tribes after the death of Solomon. In Athens a royalty on the products of the mines, import-duties, market-licenses, assessments on wealthy citizens and tribute from dependent nations were some of the ways used for raising money. In Rome, under the republic, to the spoils of conquered nations and their tribute were

added, under the empire, tolls, taxes on grain, on the privilege of Roman citizenship etc. In Europe, under the feudal system, kings were supported by their own lands, and in war claimed the services of their barons and knights at their own expense. Venice, in the middle ages, began the modern system of taxation by taxing land and levying import-duties; but throughout Europe, until the French Revolution and in some cases since, the nobles and clergy were privileged classes and paid no taxes. In many countries of Asia the right of taxation was given or sold to governors of provinces or to the highest bidder, a practice which often resulted in wringing from the people all that they had, which caused widespread misery. In Europe, too, taxes were sometimes farmed out at a lump sum.

In the United States taxes are imposed by the federal, state and municipal governments. Federal taxes are in the form of tariffs (*q. v.*) on imports, excise-duties, (mainly on liquors and tobacco) and income taxes (*q. v.*). Import and excise duties are indirect taxes, that is, not paid directly by the consumer. The bulk of state taxes are laid directly on property. The heaviest taxes usually are those laid for local purposes by the county or city. Besides the ordinary city or county taxes, assessments are often made on property specially benefited, for opening streets or roads, for street-lamps, sewers, water-service etc.

Unjust and unfair taxation has often caused discontent and even revolutions, and how to tax without oppressing the people is a deep problem. Turgot the French statesman, called it the art of plucking the goose without making it cry. In most countries it is now recognized that no tax can be levied without the consent of the representatives of the people who have to pay it. It was England's attempt to raise a stamp-duty and a customs-duty on tea in America that caused the revolt of the colonies under the celebrated cry: "No taxation without representation."

Taxidermy (*tăx'ĭ-dĕr'my*), the art of preparing the skins of animals for the purposes of the naturalist. In preparing small animals for stuffing, the skins are removed, the flesh clinging to them is cleaned away, and they are anointed with arsenical soap. This keeps the skin supple and prevents decay and attacks of insects. Larger skins are prepared with a powder containing arsenic, burnt alum, oak-bark and camphor. The animals are then stuffed and mounted.

Taxon'omy, that division of botany which deals with the classification of plants. It is one of the oldest of subjects, and not very long ago it was the only form of botanical instruction given in the schools. Specialists in this study are called taxonomists or systematists, but the plant-kingdom is so vast that no one can be a specialist in the taxonomy of all groups. Accordingly there are algologists, who classify algæ; mycologists, who classify fungi; bryologists, who classify mosses; pteridologists, who classify ferns. Ordinarily, when a man is called a systematist or a taxonomist, without any qualification, he is a specialist in the classification of seed-plants. The early attempts to classify plants were purely artificial, that is, there was no effort to indicate their real relationships. For example, one of the earliest groupings of seed-plants was into herbs, shrubs and trees. This brought together many wholly unrelated plants and kept apart many which are closely related, as unrelated words are brought together in a dictionary by the accident of their first letter. The artificial system was most highly developed by Linnæus, who invented an elaborate scheme on the basis of the number of stamens and pistils in the flower. This scheme was used until quite recently, but it has now been entirely replaced by natural systems. These systems attempt to group plants together which are really related, a family in botany meaning about what the term means among human beings, if one substitutes species for individuals. A natural system of classification can only become perfect when the complete development and structure of every plant are known. Hence such systems are being constantly revised as knowledge increases

Tay, the largest river of Scotland, pours into the German Ocean a greater bulk of water than any other river of Great Britain. The Dochart is the chief feeder of Loch Tay, and from this lake the Tay flows past Dunkeld and Perth, at the mouth of the Earn widening into the Firth of Tay, from three fourths of a mile to a mile wide, and falling into the North Sea about ten miles below Dundee, after a course of 120 miles. It is navigable to Perth, and the tide flows a mile further up. The salmon-fisheries are valuable.

Tay'lor (James) Bayard, American author and traveler, was born at Kennett Square, Pa., on Jan. 11, 1825. At 17 he was apprenticed in a printing-office, and soon began to publish poems in newspapers and magazines. In 1844 he made a walking-tour of Europe, an account of which he published as *Views Afoot.* After writing for several newspapers, he joined the editorial staff of *The New York Tribune,* in which appeared accounts of travels in California, Mexico, up the Nile, in Asia Minor, India, China and Japan. In 1878 he became minister to Germany. Taylor was a quick worker, throwing off many volumes of verse, fiction, sketches, essays, translations and criticisms, besides his 11 books of travel. As an original poet he stands high in the second rank. Some of his best travesties are in his *Echo Club.* Among the finest of his poems are *Bedouin Song, The Quaker Widow* and *The*

Old Pennsylvania Farmer. His masterpiece is the translation of Goethe's *Faust*, "one of the glories of American literature" and one of the finest translations in any literature. Perhaps the best of his novels is *The Story of Kennett*, which largely is his own story. Taylor died at Berlin, Dec. 19, 1878. Consult *Life* by Conwell.

Taylor, Jeremy, a great English churchman, was born at Cambridge, Aug. 15, 1613. He was the son of a barber, and graduated at Cambridge University, becoming a clergyman before he was 21. During the Civil War he seems to have followed the royal army, and afterwards withdrew to Wales. Here, buried from the world for 13 years, he kept a school at Newton and employed his leisure in writing the works which gave him fame. Chief among them are *Liberty of Prophesying*, *Holy Living* and *Holy Dying*. At the Restoration, Taylor, as a stanch Loyalist, was made bishop of Down and Connor, an Irish see. Seven years later, he died on Aug. 13, 1667. See *Life* by R. A. Wilmott.

Taylor, Zachary, twelfth president of the United States, was born in Orange County, Va., Sept. 24, 1784. His father was an officer of the Revolutionary War and one of the first settlers of Louisville, Ky., where Zachary was taken as a boy and lived till his 24th year, working on a plantation and getting but little schooling. Taylor entered the army in 1808 as lieutenant, and in 1812, as captain of a company of 50 men, two thirds of whom were down with fever, he defended Fort Harrison on the Wabash against a large force of Indians, led by Tecumseh (*q. v.*), the famous chief. Promoted to the rank of major for his gallantry, he was employed during the war in fighting the Indian allies of England. He built Fort Jesup in 1822, and ten years later served as colonel in the Black Hawk War. In 1836 he was ordered to Florida, where he gained an important victory over the Seminole Indians at Okeechobee, for which he was appointed brigadier-general and made commander of the United States forces in Florida. Just before the breaking out of the Mexican War Taylor was ordered to Corpus Christi, occupying the point with a force of 4,000 (1845). Next spring he marched across the disputed territory between the Nueces and the Rio Grande, and built Fort Brown opposite Matamoras. The Mexicans demanded that he retire beyond the Nueces, and on his refusal Arista crossed the Rio Grande with a force of 6,000. On May 8, 1846, Taylor defeated him at Palo Alto with 2,300 men, and a few days later drove him from a new position at Resaca de la Palma across the Rio Grande. War was at once declared by Congress; 50,000 volunteers were called for; and Taylor was made a major-general, reenforced, and ordered to invade Mexico. On Sept. 9, with 6,625 men, he attacked Monterey, which was defended by 10,000 regular troops. After ten days' siege and three days' hard fighting it surrendered. All but 5,000 volunteers and 500 regulars of his army were now sent to aid General Scott at Vera Cruz, and Taylor was left with this small force to oppose President Santa Anna's army of 21,000. He took a strong position at Buena Vista, fought a desperate battle and won a decided victory. This victory against enormous odds caused the utmost enthusiasm, and Taylor, known as "Old Rough and Ready," was nominated by the Whigs for the presidency and elected. Entering the White House in 1849, he found a Democratic majority in Congress, with the small but vigorous Free-Soil party holding the balance of power, while such exciting questions as the admission of California, the settlement of the boundaries of Texas and the organization of the newly-acquired Mexican territories were stirring the nation. Worn out by the unaccustomed turmoil of politics, the rough, good-natured soldier did not long enjoy his honors, but died on July 9, 1850, 16 months after his inauguration. See *Lives* by Fry, Montgomery and Stoddard.

ZACHARY TAYLOR

Tea, the prepared leaves of *Thea Chinensis* or the drink made from them. The plant probably is native to India, and was introduced into China and Japan. Tea has for ages been a favorite beverage in China, and now is one of the world's most generally used non-alcoholic drinks. The very best qualities do not bear transporting, and are seldom found outside of the country where grown. In the intense tropical conditions in which the native plants grow they become small trees; but in the colder climate of China and Japan they become bushy, with smaller and tougher leaves. In cultivation the shrub grows to from three to six feet, is branchy, the leaves from two to six inches long. The third year the first crop is obtained. There are three pickings a year; in April a rare quality is obtained from the new leaves. May is the time of the principal picking, and a very inferior grade is obtained from a later harvest. The black and green teas are not derived from different plants, but are the results of the different methods of preparation, the black tea being given long exposure to the air in drying. Enormous quantities of tea are produced in China, Japan, India, Ceylon and Java, but most of it is used by the native populations. Our southern states are well-adapted for varieties of tea, the plant not

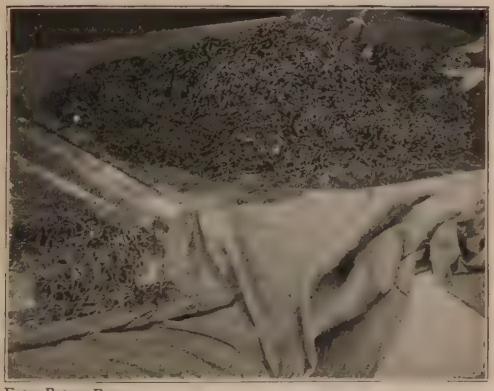
TEA PLANT. This picture of the tea plant shows the leaf, blossom and seed pods. The bush often shows blossoms and seed at the same time. If left to nature, the tea plant will grow to a height of twenty feet, but as cultivated it is kept down to from two to five feet by constant pruning. The average tea tree lives for fifty years, though it is said that there are records in China of trees living three hundred years.

From Brown Bros.

PICKING TEA IN CEYLON. Here the Tamil coolies are seen at work under the watchful eye of the task-master. The tea baskets hold about fourteen pounds and the average is three baskets per coolie per day. The picking begins about the end of April and usually lasts until the end of November. Only the tip of the shoot and soft leaves are picked.

From Brown Bros.

TEA ROLLER. After the tea is picked it is spread out on trays or racks and left to wither from eighteen to twenty hours. It is then taken to the roller, which we see in this picture. The object of rolling is to squeeze out the moisture left after withering, and to give the leaves a good twist.



From Brown Bros.

FERMENTING. The next process is fermenting. The leaf is spread on the floor of a cool room, covered with wet cloths and allowed to ferment until it turns to a bright copper tint. This is when black tea is wanted. If green tea is desired, the leaves are not fermented. Green tea and black tea may come from the same tree; the difference is due to the manner of treatment after picking.

FIRING. After fermentation the leaf is spread on wire trays and pushed into this machine which we see in the picture, where a current of hot air from 210° to 220° Fahr. is passed through it. The tea comes out dry and brittle and of a black color.

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SELECTING TEA LEAVES. After the tea has been sifted and separated into grades, the tea that is intended for exportation is spread out on a table and gone over once more, usually by girls who divide the leaves, the larger from the smaller, and pick out all objectionable bits that remain.

From Brown Bros.

SIFTING. After firing the tea is run through the sifting machine which sorts it into various grades known in the market as Broken Orange Pekoe, Orange Pekoe, Pekoe Souchong, Fannings and Dust. This picture shows a sifting machine and different grades of tea spread on trays.

requiring a tropical climate, and prior to the Civil War many southerners raised their own tea. In South Carolina commercial tea-raising has met with success, and trials are making in other southern states.

Teachers Col'lege, Columbia University, New York City, was founded in 1880 as an association for teaching home-economies. In 1884 it was reorganized under the name of the Industrial Education Association, with headquarters at 21 University Place. In 1887 it was finally incorporated as the New York College for the Training of Teachers, afterward Teachers College. As early as 1890 it became a part of Columbia University, though it retains its own trustees and administration. In 1894 the present fine site on West 120th St. was occupied. The first president of Teachers College was Nicholas Murray Butler. He was succeeded by Walter L. Hervey, who remained until 1897, when James E. Russell became dean. The college now represents an investment of some five million dollars. A new school of domestic art and science was completed in 1909. The college offers courses in education, anthropology, fine arts, biology, domestic art, domestic science, economics and social science, English, French, German, Greek and Latin, geography, geology, history, kindergarten, manual training, mathematics, music, philosophy, ethics, psychology, physical science and physical education. For admission two years of college or normal-school study are required. The general diploma is conferred upon students who have successfully completed one of the undergraduate courses offered; and a departmental diploma upon those who have studied for particular branches of school-work. The graduate-department is larger than any other in Columbia University, having nearly 700 members in 1909. It offers many courses in education, leading to the higher degrees. Its graduates are usually appointed to university, college, normal-school, secondary and public-school positions; or to school-superintendencies or principalships.

There also are many extension-courses offered, both in the college and in buildings easily accessible.

The college has two observation and practice schools — Horace Mann School and Speyer School. Student-teachers observe classes in Horace Mann School, but do not teach them. Horace Mann School, with about 1,000 pupils, has two kindergartens, seven grammar-grades and a five-year high-school course. The tuition is $75 in the kindergarten, $150 in the primary grades, $200 in the grammar grades and $250 in the high school. The school is on Broadway, from 120th to 121st street, in a building given by Mr. and Mrs. V. Everit Macy.

Speyer School, with about 200 pupils, furnishes opportunity for practice-teaching and experimentation. It is entirely free. It occupies a building at 94 Lawrence Street, the gift of Mr. James Speyer. In the afternoons and evenings the school carries on neighborhood-work. Gymnasium, cooking, sewing and carpentry classes are among the school activities.

Bryson Library of Teachers College supplements the university's library of 400,000 volumes with a special collection of over 40,000 volumes, chiefly upon the subject of education. It is open to students and officers of the university and to public-school teachers in the city.

The college publications include *The Teachers College Record* and *The Teachers College Contributions to Education. The Record* is issued continuously every other month except July. *The Contributions* consist of papers representing original investigations by advanced students or officers, edited by the dean and the college professors in charge of the subject treated. From four to six numbers appear each year.

The college and its schools have a staff of 150 instructors, including many distinguished educators and investigators. It represents a university school of education upon the same footing as the schools of law, medicine and science. The total attendance of the college and its schools is about 3,500 persons.

Teachers' Institute, a gathering of public school teachers of a state, county or city. An institute is held yearly or oftener, and lasts usually from one to two weeks. Instruction is given by lectures, class-drills etc. in the best methods of teaching and governing schools. Sometimes actual classes of children are taught in the presence of the members of the institute, which is probably the most profitable of the many methods in use. The members of the institute, as well as specially engaged lecturers, take part. Institutes have proved a valuable help to teachers, and have raised the standard of teaching throughout the country. The first institute was held by Henry Barnard, state superintendent of schools in Connecticut, in 1839.

Teach'ing, Method of. Method in teaching depends essentially upon methods of learning. The latter are commonly divided into three classes: the trial-and-error method, imitation and reasoning. All learning aims primarily at doing something which the learner is not able to accomplish by instinct, but must master by experience. The simplest method, that of trial-and-error, consists in trying again and again until finally, largely by accident, the desired result is gained. The experiment usually needs to be repeated many times before the act is thoroughly learned. Then it becomes habitual and practically automatic. This method is almost the sole one with the lower animals, and by it nearly

all the simpler acts of human skill are learned; as grasping, standing, walking etc. If the learner possess intelligence enough to imitate, he can shorten the method of trial-and-error by copying the successful acts of others. Older children acquire the more advanced types of skill by the help of imitation — as piano-playing, tennis, the use of tools etc. Here the trial-and-error method is not abandoned but simply aided. Indeed, many models are successfully imitated only by a number of trial-and-error experiments. The method of reasoning consists, as the name implies, in applying one's knowledge to the solution of a new situation. One stops to think instead of experimenting blindly. This method is usually employed in connection with the other methods, and only by the most intelligent beings.

When mankind endeavors consciously to teach his fellows, his purpose is to shorten and render easier the process of learning by trial-and-error. The simplest methods of doing this consist in presenting a model for imitation or in giving instruction in the method of performing the act. The success of such methods is easily tested when they aim to instruct in some simple act of skill, immediately and constantly useful, as speech, the use of tools etc. When, however, the aim is not so immediately to be realized, but consists, as with most of the school-work of to-day, in equipping the child with knowledge and skill to be applied by him at a time far distant and in the solution of problems the details of which can not be foreseen, the simpler methods of teaching no longer suffice. The divorce between the acquisition of knowledge and skill and the use of them and the wide difference between the conditions under which the child first learns and those in which he applies his learning demand the utmost art of method in order that education may help life and learning lead to practice. The criticisms of old-fashioned school-method may be summed up under two heads. First, it often fails to provide the proper and adequate motive for learning and relies instead on purely school-motives, like rivalry, fear of punishment etc. The true motive is desire to do some work that can not be performed without the knowledge in question. The teacher, however, finds it difficult or impossible to rouse in the child a living sense of the value of what he is called upon to learn, because it is to be used in a later life that the child cannot realize very clearly. Hence artificial motives are used, and the learner finds in the entire school-program something arbitrary that he strives to outwit. The second criticism is that knowledge is imparted, learned and recited in a set form instead of in a variety of conditions. The result is that the student fails to use it in any other connection than that in which it originally appeared. Arithmetic is used to pass school-examinations but not to solve actual business-problems.

The reformers of method have endeavored to meet the first criticism by developing interest (*q. v.*) in the school-work and the second by such devices as will lead the learner to use his knowledge in a variety of conditions. The correlation of subjects (*q. v.*), so that each is made to illuminate others, and the inductive method represent the most important of these devices. The inductive method rests on the notion that the mastery of general concepts, principles or laws is the aim of all instruction. This is because only in such generalized forms can knowledge be applied to new conditions. But in order to master principles it is necessary for the learner to start from the concrete facts upon which these are based and by his own insight discern the generalization involved therein. Only thus can he be relied upon to recognize the principle when the conditions vary. Moreover, he must be practiced in the application of these principles. In accordance with these requirements the so-called "formal steps" have been evolved by Herbart, Ziller, Rein and Charles and Frank McMurry. They constitute what is known as the method of the recitation, and may be described as follows: After the subject of study for the lesson has been announced, the pupils are called upon for what they know concerning it. This constitutes the preparation. After it is finished comes the presentation. Here whatever questions remain unsettled are attacked. They may be answered either in the form of a lecture by the teacher, the study of a textbook or, perhaps partly or even wholly, by the original efforts of the pupils. The latter method is called the method of development. It may be based on direct observation of the facts involved, as in an excursion, a laboratory experiment etc. Presentation is followed by comparison, in which facts similar to those studied are recalled and compared. Then comes the generalization, in which the principle behind the entire class of facts is deduced. Finally, the application insures that this principle shall be employed to explain new cases. The entire treatment may require several lesson-periods and is called a lesson-unit.

This method has been attacked as not providing for all necessary kinds of school-work. It is probable, however, that specific exercises like drill, review etc. are all provided for, especially in the step of application. Professor Dewey suggests that the motive by which interest should be secured comes through the anticipation of the application. To get this motive and the dependent interest, his method is to have the school-room a little society in which living

problems are being continually worked out. For example, the child learns to read because only thus can he get certain information that he needs in the group activity of the school. See APPERCEPTION; CORRELATION; ASSOCIATION OF IDEAS; CHILD-STUDY; EDUCATION, MODERN; INTEREST; MEMORIZING; and MENTAL DISCIPLINE. For analytic and synthetic methods consult *Psychology for Teachers*. Consult *The Method of the Recitation*, McMurry; *Principles of Teaching*, Thorndike Seiler; and *The Educative Process*, Bagley.

Teak, the name of *Tectona grandis*, a member of the verbena family. It is a forest-tree of India, and its timber is prized as by far the most serviceable of all timbers for ship-building. The timber resembles mahogany, and is more durable and much lighter than oak. There also is a teak highly valued for furniture, exquisite carved pieces being offered for sale. The color of the wood is a dark brown.

TEAK

Teal, small ducks belonging to the group of river-ducks. They are abundant in Europe, America and most other parts of the world. There are ten or fifteen kinds in the United States. The two best-known forms are the green-winged and the blue-winged teal. The former is a beautiful little duck, about 14 inches long, abundant during migrations and one of the best ducks as food. It feeds on seeds of grass, small acorns, fallen grapes, water-insects, small snails and worms. The blue-winged teal, with a blue band across the wings, is larger, being about 16 inches long. It is the most numerous of the smaller ducks in the eastern United States. West of the Rocky Mountains it is replaced by the cinnamon teal.

Tech'nical Schools. This term embraces all institutions whose object is to prepare its students directly for some particular career or vocation as opposed to those giving a so-called liberal education. Usually, however, it is restricted to that class of schools especially devoted to the investigation and teaching of industrial and mechanical arts and sciences, as civil, mechanical, mining, electrical, chemical and sanitary engineering, architecture, draughting etc. They usually are institutions of college or university grade, to which the titles of engineering schools, institutes of technology, polytechnic institutes and schools of applied science are variously given. The great majority confer only the degree of bachelor of science at the end of the four years' course and the professional degrees of C.E. and M.E. only after the completion of at least a year's graduate work in residence and three years of successful professional work. They have arisen almost invariably in response to the industrial demands of the district in which they were founded, as, for instance, the Colorado School of Mines. They practically are a development of the last half-century. On the basis of control there are three types of technical schools in the United States: those founded by private individuals and relying for support mainly upon private endowment, as Rensselaer Polytechnic Institute of Troy, N. Y.; those forming a department of some college or university (as the engineering departments of the Universities of Michigan, Pennsylvania etc.) and usually sharing in the common resources of the university of which they form a part; and those supported largely if not entirely by state government expense. The majority of these are connected with some university. Massachusetts Institute of Technology at Boston perhaps is the most famous technical school in America.

Teck, Alexander, Augustus, Frederick, Prince of (1874-), who succeeded the Duke of Connaught (*q. v.*), as Governor-General of Canada, is a brother of Queen Mary and husband of Princess Alice of Albany, granddaughter of Queen Victoria. He was educated at Eton and Sandhurst, served in Matabeleland in 1896, and in the Boer War (*q. v.*), in both of which he won the Queen's medal. He is the third son of the late Duke of Teck.

Tecumseh (*tĕ-kŭm'sĕ*), a famous chief of the Shawnee Indians, was born near the site of Springfield, O., about 1768. Elskwatawa, his brother, the prophet, preached against the use of the white man's liquor and food, and about 1805 Tecumseh tried to gather all the western Indians into a confederacy against the whites. As a result, 400 gathered at Greenville. In 1811, while the chief was away urging the Seminoles and Creeks to rebel, General Harrison marched on his encampment to demand that plunder be given up and that the warriors go back to their tribes. The prophet decided to fight, but was worsted and his prestige among the Indians destroyed in the battle of Tippecanoe. On the outbreak of the War of 1812 Tecumseh led a large force to the support of the British in Canada. He was made a brigadier-general in the English service, and fought bravely in several battles. He was wounded at Maguaga and also while bravely defending a ford on General Proctor's retreat before General Harrison. At the siege of Fort Meigs, where he and Proctor

held joint command, he saved the lives of the American prisoners. At the battle of the Thames in Canada he believed he would be killed. So he laid aside his general's uniform and sword, and, dressed as an Indian warrior, fought desperately till he was shot (Oct. 5, 1813). It is believed that he was killed by Richard Mentor Johnson. See *Life* by Benjamin Drake.

Teeth are structures derived from the skin of the mouth, involving both the epidermis and the dermis. Only those of vertebrated animals need be considered. In fishes and snakes they usually are sharp processes without sockets, arising from bones of the jaws and the mouth-parts. In crocodiles and all mammals they are located in sockets. The teeth always show the habits and food of animals, and, therefore, are much used by naturalists in classification. They are of great importance to the students of fossil life, because they are usually well-preserved on account of their hardness. They have been of great service in tracing the evolution of animal life during geological periods. In the herb-eating animals there have been slow changes in the pattern of the crown of molar teeth, which can be read by students like hieroglyphics. The teeth of mammals contain living pulp on the inside provided with nerves and blood-vessels; this is surrounded by dentine or ivory, a bony substance produced from the dermis. The dentine is covered above the jaws by enamel, which is the hardest substance in the human body. The roots are covered with cement, which joins the enamel and sometimes extends into it. When the enamel is broken or worn through, the much softer dentine is exposed; this decays and leads to cavities in the teeth and to their destruction, if the cavities are not cleaned and filled. The typical number of teeth in mammals is 44, 22 on each jaw, and not 32, as most people suppose, because the latter number is found in man. Teeth of mammals are divided into incisors or cutting-teeth, canines or sharp tearing-teeth, prēmolars which appear earliest, and molars or grinding-teeth. There usually are two sets which appear in succession, the milk-teeth or temporary ones and the permanent set. The teeth are subject to great modifications. The great cutting-teeth of beavers and the tusks of elephants are modified incisors; the tusks of the walrus and those of the wild boar are enlarged canines. The molars or grinding-teeth have a pattern on the crown that is characteristic of the different groups of mammals.

Tegner (*tĕng'nâr'*), **Esai'as,** a popular Swedish poet, was born at Kyrkerud in 1782. He was graduated and appointed lecturer on æsthetics at the University of Lund. His poem, *Sweden*, which appeared in 1811, brought widespread popularity. Next year he took charge of a parish, besides the chair of Greek in the university, and yet found time to write, among other works, *Axel*, a poetic romance, and his epic, *Frithiof's Saga*, which at once became the most popular poem of Sweden. Its author was at once made bishop of Wexio, sat in the national legislature in the chamber of the clergy, and became noted as a political leader and speaker. When just about to be appointed archbishop, Tegner had an attack of insanity, which he inherited. He recovered his sanity but not his health, and died in 1846. *The Children of the Lord's Supper* has been finely translated into English verse by Longfellow.

Teheran (*tĕ-h'rān'*), capital of Persia, stands 70 miles south of the Caspian Sea, on a wide, stony plain. On the northeast are the Elburz Mountains, the highest peak of which is Demavend, 22,000 feet above the sea. The town is built mainly of mud-houses, packed within a mud-wall 20 feet high and four miles around. The finest building is the bazar of Taki Khan. In the suburbs are the shah's palace, called the ark or citadel, and the castle of the *kajars*, another royal home. In 1849 a polytechnic school was opened with European professors, introducing science and the western languages. Carpets, shoes, hats and linen goods are manufactured. Teheran was unimportant until made the capital of Persia by Aga Mohammed Khan about 1796. Population 280,000.

Tehuantepec (*tā-wān'tā-pĕk'*), an isthmus of Mexico, between the Bay of Campeche on the Gulf of Mexico and the Bay of Tehuantepec on the Pacific Ocean. Its narrowest part is 130 miles wide. It contains lakes, lagoons and Coatzacoalcos and Tehuantepec Rivers. One of the several plans to join the Atlantic and Pacific by a ship-canal proposed crossing this peninsula, in part by deepening and widening Coatzacoalcos River. The Mexican government on Jan. 23, 1907, opened its interoceanic railway (192.42 miles long) from the mouth of the Coatzacoalcos to the Pacific port of Salina Cruz. It saves 10,797 miles from New York to San Francisco through the Straits of Magellan.

Tekeli, Emeric, Count, a celebrated Hungarian patriot, was born in Zips, Hungary, in 1656. His father had taken part in a plot to free Hungary, and after his death Tekeli was forced to flee to Poland. Unable to get possession of his estates, he invaded Hungary, when but 22, at the head of 20,000 men furnished by the prince of Transylvania. He was joined by crowds of his dissatisfied countrymen, made inroads into Austria, Styria and Moravia, and forced Leopold I, the Austrian emperor, to make promises which gained part of

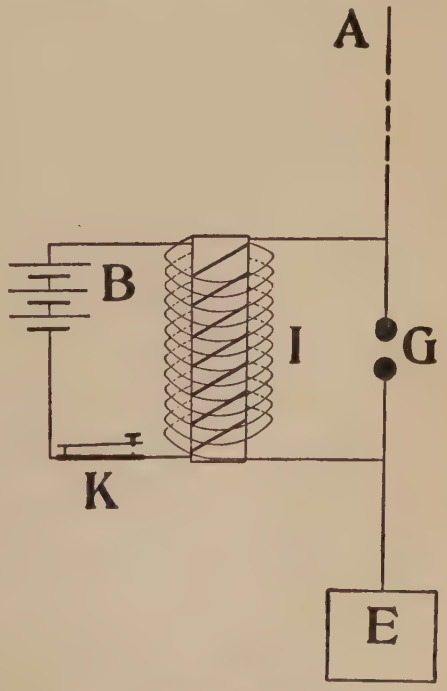
Tekeli's followers. But Tekeli would not trust the emperor and refused to disarm. He was supported by the Turks, who crowned him king of upper Hungary, and he took part in the famous raid of Kara Mustapha into Austria. Soon many of his partisans deserted him, and his friends, the Turks, imprisoned him, but again in 1690 he was at the head of a Turkish force with which he burst into Transylvania, routed the Austrians and roused the Hungarians to renewed efforts for freedom. But several Austrian victories over the Turks forced them to sign a treaty agreeing no longer to support the Hungarian rebels. As a result, Count Tekeli was driven from the country for whose deliverance he had risked everything, and died at Constantinople in 1705. His wife was a noted beauty, but more noted for her gallant defense of her castle against an army of Austrians.

Telau'tograph, an ingenious instrument invented by Elisha Gray, for reproducing autograph-writing, messages, drawings and sketches in facsimile and transmitting such to places distant many miles apart by means of an electric motor driven by a local battery. The message, at the receiving point, is written on the sketch drawn by pencil on a roll of paper drawn over drums, and so arranged that they can be shipped forward by the operator at intervals, as each line of writing or drawing is finished. The receiving-pen, which is a small glass-tube furnished with writing-fluid by capillary attraction, being controlled by the current-impulses from the transmitting pencil, it follows and reproduces all its movements, which are then electrically transmitted.

Tel'egraph, an instrument for transmitting signals to a distance. Unless otherwise specified the word is generally used to mean the electric telegraph, which is the only one we shall here discuss.

Electric signals appear to have been first transmitted on a commercial scale by Wheatstone and Cooke in England in 1837. At each end of the "line," which consisted of five insulated metallic wires, they placed five galvanometers. Different combinations of deflections to the right and left indicated different letters. (See GALVANOMETER.) Later a single galvanometer was used, different combinations of deflections indicating as before different letters. About the same time S. F. B. Morse (*q. v.*) in America succeeded in perfecting a receiver in which the signals could not only be seen and heard, but were automatically recorded. This is the instrument which was in universal use in the United States until operators learned to read the message by the click of the instrument. Accordingly, for ordinary work a telegraph line is provided at each end with a *battery* for producing an electric current, a *key* for opening and closing the circuit and a small electromagnet, with pivoted armature, the so-called *sounder* or *receiver*. More recently the Wheatstone bridge has been applied to the telegraph line in such a way that two messages may be sent over a line in opposite directions at the same time. This is called the *duplex telegraph*. Edison has invented a method for sending two messages over the same line in the same direction at the same time. This is known as the *diplex telegraph*. By combining these two, four simultaneous messages may be sent. This system is called the *quadruplex telegraph*. Various plans have been suggested for sending even more than four messages at once. This is called the *multiplex telegraph*. Rowland (*q. v.*) perfected a system which will not only transmit six or eight simultaneous messages, but will deliver them printed on a typewriter; and not only so, but the sending instrument of the Rowland telegraph is merely the ordinary keyboard of a typewriter. For details concerning these various systems and concerning the important subject of submarine telegraph, first worked out by Lord Kelvin, the student is referred to the larger treatises.

Teleg'raphy, Wireless, consists in sending and receiving electrical signals between places without the use of connecting wires.



TRANSMITTER

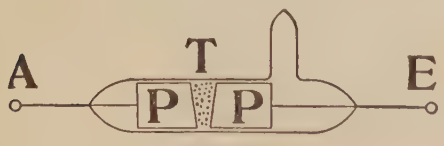
FIG. I. (*I*) induction coil; (*G*) spark gap; (*K*) battery key; (*A*) vertical wire; (*E*) ground.

Possible plans of wireless telegraphy were shown by experiments of John Trowbridge of Harvard University, W. H. Preece of the British Postal Telegraph and others between 1880 and 1890. These earlier attempts used the earth as a conductor or depended upon inducing currents by electromagnetic induction (see ELECTRICITY) between two systems of wires. In 1892 Preece for the British Lighthouse Board used a combination of the induction and conduction methods to reach islands six miles and more from the mainland. He concluded that, though communication across space was thus practical under certain conditions, the apparatus was too cumbrous and costly except for special cases.

The only wireless telegraphy in use now is that based on the electrical researches of James Clerk-Maxwell and Heinrich Hertz, and large credit for developing this is due to Guglielmo Marconi (*q. v.*). Marconi's early experiments in wireless telegraphy, made in 1896, were supported by the British postal authorities and reached about ten miles; by 1899 he had established wireless telegraphy 30 miles across the English Channel; and on Dec. 12, 1901, a signal was received by wireless telegraphy in Newfoundland from Cornwall, England, a distance of 1,800 miles. On Jan. 19, 1903, a wireless message was sent from President Roosevelt to King Edward across the Atlantic between Cape Cod and Cornwall.

Marconi's system is in all principles the carrying out on a large scale of Hertz's electric wave experiment of 1887. Marconi' s transmitter consists (Fig. I) of an induction coil I which produces electric sparks across an air or oil gap G, between two metal balls, when the battery key K is closed. When the balls, wires and other parts, EGA, are of proper size and shape, the electric discharge produces a train of electric waves which go out in all directions with the velocity of light. These electric waves pass through air, wood, dry earth etc., that is, through poor electric conductors, as light passes through glass. They are reflected from metals and other good conductors.

The receiver mostly used at the present time for detecting these electric waves is

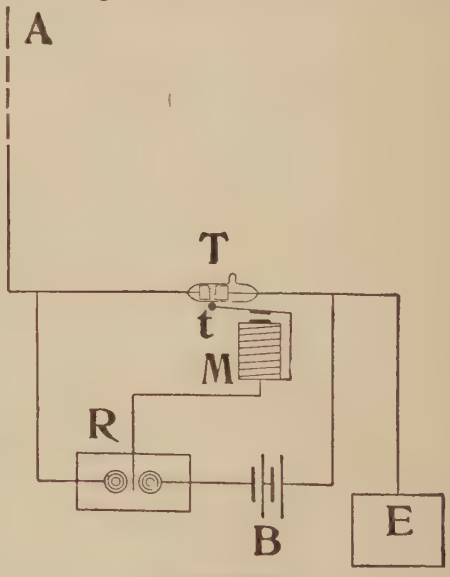


COHERER

FIG. II. (*T*) exhausted glass tube; (*PP*) silver terminals separated by metal filings and connected with (*A*) vertical wire and (*E*) ground.

the coherer invented by E. Branly of Paris in 1890. It consists of (Fig. II) a glass-tube T with two silver plugs PP, the plugs being separated by a small quantity of metal filings mostly nickel and silver. The loose filings offer a high resistance to the electric current, but become a fairly good conductor under the action of an electric wave; that is, they cohere. The silver plugs are in a circuit with the usual telegraphic receiving instruments, (Fig. III) a relay R, and a sounder M (or a Morse ink recorder), and a tapper t, for shaking the filings so that the coherer may be ready for the next signal. Each train of electric waves thus closes the circuit through the telegraphic instruments. The ordinary Morse alphabet, made by combinations of long and short signals, is used. (See TELEGRAPH.)

Marconi's great advances have been (1) in showing, as part both of transmitter and of receiver, a high vertical wire or series of wires using towers often 100 feet or more



RECEIVER

FIG. III. (*T*) coherer; (*A*) vertical wire; (*E*) ground; (*R*) relay; (*M*) sounder or recorder; (*t*) tapper.

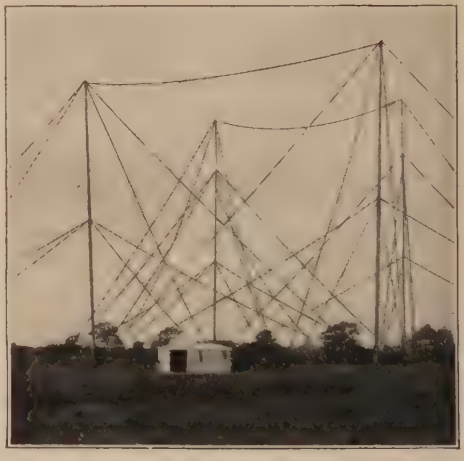
high; (2) in increasing the sensitiveness of the coherer far beyond anything known before; (3) in devising and using very powerful discharge-currents.

A defect of wireless telegraphy has been that all receiving-stations within the radius of action of the transmitter receive the electric signals. To overcome this, attempts have been made to tune or make syntonic the transmitting and receiving apparatus, so that receivers will respond only to signals from corresponding transmitters. The method in syntonic telegraphy is to use combinations of coils and condensers or Leyden jars with the discharge-balls and the wave-detector, instead of using the

MARCONI'S OWN EXPLANATION

This is what a wireless message would look like if you could see it. It is a remarkable photograph and shows the electric waves passing along a wire at a station. They are invisible to the naked eye.

ON the right of the photograph of the wireless message is a picture of Marconi, the inventor of the wireless telegraph. He says that the electric waves which carry wireless messages are like the ripples which go out in all directions when you drop a pebble into the water. Sound is also made by waves—different sounds by waves of different lengths. The waves sent out by a wireless instrument can be received only by an instrument tuned to waves of the same length. Heat, light and electricity are all forms of wave motion, and Marconi says that it will be only a step further when we shall have wireless light, heat and electric power.

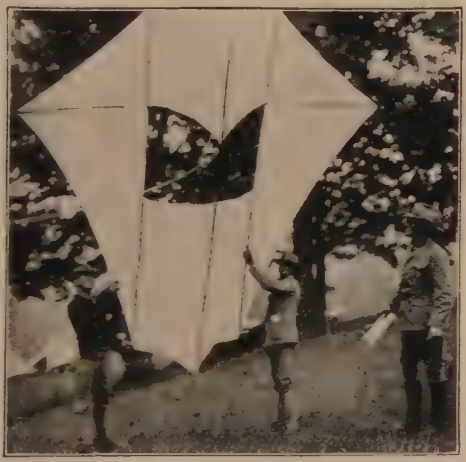


On the right is shown one of the earlier "wireless" stations. The vibrations of the waves from the sending instrument are carried up into the air on these wires and go out from them in all directions. Incoming waves are caught by the wires and carried down to the receiving instrument.

This is the inside of a Marconi station. The wires shown in the picture of the station above carry the messages down, where they are received by these instruments

OF THE WIRELESS TELEGRAPH

One of the greatest fields for wireless telegraphy is on shipboard. Vessels in peril can "call" for help, or instructions can be sent to each vessel by the commanding officer of a fleet. This picture shows cadets in our navy taking instructions in wireless telegraphy.



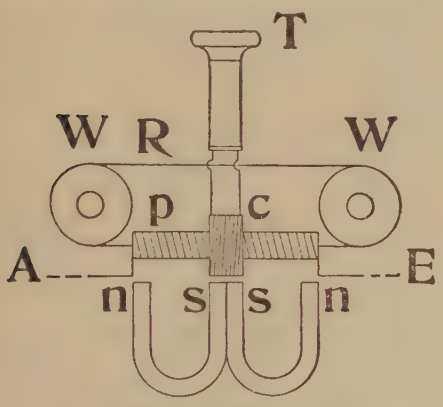
Kites are used by the signal corps of our army to carry wires up into the air for receiving and sending messages.

This is an Italian battleship, as you can see from the flag. The wires are strung for receiving and sending messages.

Telephone messages are also sent without wires. The system here illustrated was invented by Lee De Forest. The operator has the receivers clasped to both ears, just as in wireless telegraphy. De Forest is also the inventor of one of a number of wireless telegraph systems now in use.

simpler transmitter and receiver of the earlier experiments. Many patents on this line have been taken out, but no public commercial test of a syntonic system has been satisfactory.

Another defect has been the slowness, largely owing to the necessity of tapping the coherer each time. A number of new wave-detectors have been recently brought into use. Marconi has invented a magnetic receiver, a figure of which is shown (Fig. IV). A steel ribbon is carried over wheels through a coil which is in the circuit AE of the receiver. The magnetic effect of the wave on the steel ribbon is read by sounds in the telephone. The Italian naval apparatus uses a form of mercury coherer; Fessenden uses a thermal receiver; while an electrolytic receiver is used by another inventor. In communicating with and between ships at sea it has proved invaluable. Many of the large Atlantic steamships and all warships are equipped with wireless outfits, and often receive messages during a large part of their trip. The United States navy department maintains wireless stations at strategic points along the



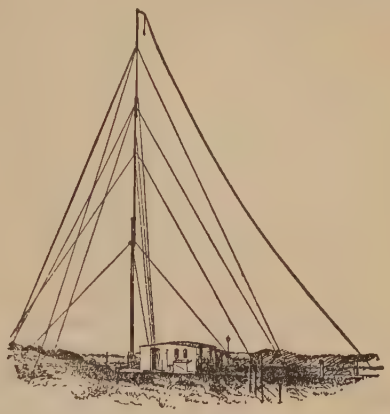
MAGNETIC WAVE-DETECTOR

Fig. IV. (*R*) steel ribbon carried over wheels (*WW*) through coil (*p*) in receiving circuit (*AE*); (*T*) telephone to detect magnetic effects made by wave.

coast.

The wireless telegraph proved itself to be of very great value in operations both on land and sea in the European War. Although a commander's army might cover northern France and part of Belgium he could, through the use of the wireless telegraph, the telephone and the aeroplane (see "Aeronautics") know more about the movements of each regiment at any moment than Napoleon could of his whole army at the Battle of Leipsic. With the advance of an army telegraph lines are laid at the rate of 1¼ miles an hour and telephone communication is established even faster. In communicating orders, preference is given to the telegraph and telephone owing to the danger of information being picked up by the enemy.

Wireless telephony is also in the process of development. The first step in this direction was the production of audible signals, the continuous or nearly continuous waves being cut up into Morse signals by the operator's key or connected with a telephone. By employing a microphone transmitter at the sending end to vary the amplitude but not the length of the



WIRELESS TELEGRAPH STATION SHOWING VERTICAL WIRES

waves and at the receiving end an electrolitic receiver, words are transmitted, thus producing telephonic communications. The whole subject is interesting, including effect of sunlight on wave movements.

For the benefit of high school boys who know the delights of operating wireless outfits it should be stated that the law now requires every wireless operator, whether an amateur or professional, to have a license and a code signature. The government inspectors are very clever in locating hidden apparatus. They can trace "unlicensed" waves to their source, much as the bee hunter locates the bee in a hollow tree; even where the wires are not strung over the house. When what are called "outlaw waves" are reported, the inspector visits several licensed amateur stations and learns in what neighborhood the waves are most distinct. Then with a portable receiving set he follows the "scent" and soon locates the offender.

Read *Signaling Through Space Without Wires* by Sir Oliver Lodge (q. v.); *Wireless Telegraph Boy*, Trowbridge; *Wireless Station at Silver Fox Farm*, Kaler; *Making Wireless Outfits*, Harrison; *Wireless Telegraphy for Amateurs and Students*, St. John.

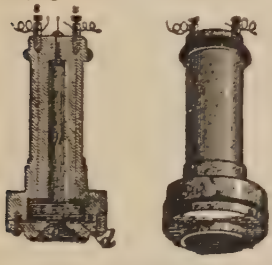
Telem'eter, an instrument for finding the distance of an inaccessible object. In military circles this instrument is generally called a range-finder. Nearly all telemeters are based upon one of two general principles: (1) The image of a distant object, produced by a lens, is geometrically similar to the object itself and depends for its size upon the distance of the object; (2) having chosen a convenient base-line of known length, it is possible by measuring the angle between this base and the direction of the distant object (first at one end of the base-line and then at the other) to compute the distance of the object. A great variety of these instruments have been invented, some adapted to infantry in the field and therefore compact and less accurate, others

adapted to naval operations in which much larger base-lines and hence much greater accuracy can be obtained.

A similar process when employed by surveyors is called stadia-measurement.

Telep'athy, a term used to cover all cases of impression received at a distance without the normal operation of the recognized sense-organs. It is based on the theory that two minds can communicate independently of the physical body. The subject has been so entangled with clairvoyancy and "fake" forms of hypnotism, that much so-called telepathy is unscientific. But it has been scientifically studied since 1882. The mind initiating the process is the agent, and the other mind the percipient. A common form of the experiment is for the agent to draw a geometrical figure on a card and the percipient, who can neither see, hear, taste, touch nor smell what is being done, reproduces the figure. Prof. Crookes suggests that the process may be one of transference of intense thought by inconceivably minute and rapid ether-waves. Other popular manifestations are the performances of test-mediums and apparitions of a person to some distant friend at the time of the person's death. The verdict of science, however, still is: "Not proven."

Tel'ephone, an instrument for reproducing speech at a distance from its source. Perhaps the simplest solution of this problem is to connect two stretched membranes by a stretched string. The pulsations of the human voice near one membrane will set it into vibration; while the string will transmit these vibrations to the second membrane, which by its vibrations reproduces the original sound for a listening ear. This is the so-called mechanical or acoustic telephone; but it is limited to such short distances — less than a mile — that we shall not discuss it.



BELL TELEPHONE

The first electric telephone was undoubtedly invented by Philip Reis in Germany in 1861. To him we owe also the name.

Reis' instrument, like all others of this class, consisted of three parts: one which transmitted the message; the line or wire over which the message was carried; and a receiver which finally transformed the message into sound-waves for the listening ear. His transmitter was very simple, being merely a diaphragm carrying a metallic point which alternately made and broke an electric current when the diaphragm was set in vibration by the human voice. The line was an ordinary metallic wire. The receiver was an electromagnet mounted on a sounding-box. As the iron core of the magnet was alternately magnetized and demagnetized, it emitted a sound — the well-known Page effect, discovered by Dr. Page, an American, in 1837. In this manner Reis was able to transmit the proper *pitch* and *intensity;* but he was totally unable to convey the correct *quality.* (See ACOUSTICS for the three distinguishing features of a sound.) The proper method of transmitting the true quality of a note is the joint discovery of the late Elisha Gray and of Graham Bell.

The essential point in the solution — and, therefore, the essential discovery of these gentlemen — is the use of *continuous* electric currents instead of the *interrupted* ones employed by Reis.

The instrument which Bell patented and perfected, in universal use to-day as a receiver, consists of a soft-iron diaphragm, held by its periphery, in front of an electromagnet. When an electric current, even a very minute one, is passed through the coil of the electromagnet, the iron disk is attracted. If the current is a pulsating one, the disk is set into forced vibration, accurately following the variations of the current.

FIG. 1

In figure 1 the diaphragm is shown at D and the electromagnet at A. The line wires which convey the message to the receiver are attached at E.

For a transmitter, a microphone of the carbon type is almost universally employed. Two forms are in very common use: one, the Blake transmitter, is made up of a piece of gas carbon resting against a platinum pin; the other, devised by Henning, consists of a

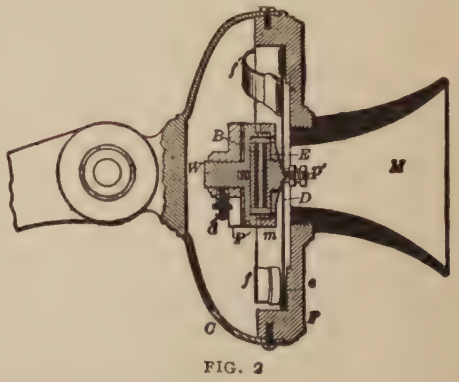


FIG. 2

layer of hard carbon granules. The accompanying diagram, figure 2, shows at D the diaphragm which is set in vibration by the human voice. Between the carbon blocks, B and E, are placed the carbon granules

which act as a microphone. See MICROPHONE.

Of much practical value, owing to the amount of business transacted over telephones which it is desirable to accurately record, is the Edison (*q. v.*) telescribe; a phonograph (*q. v.*) attachment for telephones, patented in 1915.

Important improvements were introduced into submarine telephony by Professor Pupin of Columbia College. Previously the maximum working-distance of the telephone for under-water lines had been about 25 miles. Dr. Pupin has extended this to 250 miles. For Pupin's account see *Transactions of the American Institute of Electric Engineers*, Vol. XV (1899) and succeeding volumes.

Tel'ephotog'raphy. The photographing of distant objects or of near objects on an enlarged scale with a camera provided with a special lens like the eye-piece of a telescope. Lenses are now made for use in hand cameras and are of great value in securing details of distant objects that cannot be photographed in any other way, including animals which cannot be approached closely. The light rays are intercepted by a double convex lens so as to be spread apart and caused to come to a focus beyond the point where they would otherwise fall in passing through the magnifying lens. The size can be varied by altering the distance between the system of lenses. The farther the camera is extended, and the closer the lenses, the larger is the image. In the hand camera the lenses are mounted so as to allow great variation in the distance between them. One camera of this type is made especially for balloon photography, another for snapshots, and so on. Telephotography, as the name indicates, combines the principles of the photographic camera and the telescope.

Tel'escope, an instrument for viewing distant objects, was invented, apparently, by Franz Lippershey, a Dutch spectacle-maker at Middelburg, in 1608. Shortly after this date Galileo heard of Lippershey's instrument and made one for himself. With this instrument he discovered four satellites of Jupiter and the variable phases of Venus, thus completely establishing the heliocentric views of Copernicus. The telescope employed by Galileo essentially was an opera-glass, consisting of a small double-concave (or negative) lens immediately in front of the eye, combined with a double-convex (or positive) lens at some dis ance in front of the eye. (See OPERA-GLASS). But there are two reasons why the Galilean telescope is no longer used: It has a very limited field, *i. e.*, no large extent of the object can be viewed with it at one time. (2) One cannot use a micrometer eye-piece with it. (See MICROMETER.)

The telescope almost universally employed in modern times is the astronomical telescope made of two converging lenses, as shown in Fig. 1. Let it be borne in mind that the purpose of the telescope is twofold: To gather a large amount of light into a small bundle of rays, so that these can all enter the pupil of the eye and thus make any luminous point appear much brighter than it would to the unaided eye; (2) to magnify the angle subtended by two luminous points and thus make them appear farther apart than when seen by the naked eye. How the first purpose is ac-

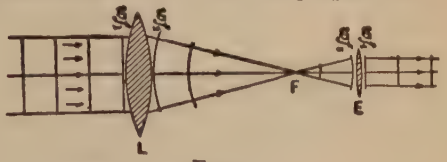


FIG. 1

complished will be evident from Fig. 1, where wf_1 indicates the plane wave-front of the light coming from a distant star. The effect of the object-lens, L, is to convert this parallel bundle of rays into a conical bundle, having its apex or focus at F. The light leaving F is collected by the eye-lens, E, and converted again into a parallel beam, wf_4, which is small enough, say $\frac{1}{8}$ of an inch, to enter the pupil of the eye. In this way nearly all the light which falls on the objective is made to enter the eye, making the star appear much brighter through the telescope than without it. How the second purpose of the telescope is accomplished will be clear from Fig. 2, which is the same as Fig. 1, except that it

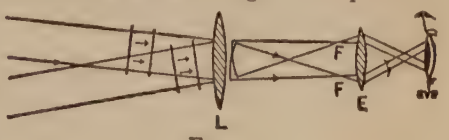


FIG. 2

shows light coming from two distant stars, say a double star. Each star will send a beam of parallel rays to the objective, L. But the two beams of parallel rays which emerge from the eye-lens make a much larger angle with each other than do the two beams of parallel rays which enter the objective. The telescope thus magnifies the angular distance between two stars. Since the human eye cannot distinguish two points as separate unless they subtend an angle of two minutes, the telescope enables us to recognize many stars as double when to the naked eye they appear as single.

The magnifying power of a telescope is numerically equal to the ratio of the diameters of the incident and emergent beams.

The best specimens of the astronomical telescope in existence are the 36-inch glass of Lick Observatory and the 40-inch glass of Yerkes Observatory, both made by the late Alvan G. Clark. On good nights these

instruments permit the use of a magnifying power of from 2,000 to 3,000.

The reflecting telescope is little used and can therefore not be discussed within the limits of this article. Since, however, the reflector is interesting from a historical point of view, the student will do well to consult chapter vi. of Miss Clerke's *History of Astronomy.*

Teleutospore (*tē-lū'tō-spōr*) (in plants), a peculiar asexual spore which is developed by the rusts, which are parasitic fungi. Wheat-rust is a common example. The name refers to the fact that these spores are the last spores of the season which appear on the mycelium. As they must endure through the winter, they have very heavy walls and hence they usually are very dark to completely black. Often they are called winter-spores. In wheat-rust the teleutospores form the so-called black rust which appears on the stubble. See ÆCIDIOMYCETES.

Tell, William, according to Swiss story, was a patriot who in the 14th century rescued his native district from the tyranny of Austria. Albert I of Austria was trying to annex the forest-cantons, and was represented there by his bailiff, Gessler, whose rule was very cruel. Among other acts of tyranny Gessler placed the ducal hat of Austria on top of a long pole in the market-place of Altdorf, and gave orders that no one should pass without uncovering his head. Tell and his little boy one day took no notice of the hat and were dragged before the bailiff. Knowing Tell's reputation as a crossbowman, Gessler ordered him to shoot an apple from his son's head, and told him that if he missed it he should die. To the wonder of all, he hit the apple without injuring the boy. But Gessler noticed a second arrow in the bowman's girdle, and asked what he had meant to do with it. "To have shot you, had I killed my son" was the answer. He was at once seized, but escaped on his way to prison, and soon after shot Gessler through the heart. Then followed the great war of the Swiss against Austria, lasting from 1307 to 1499. Tell is said to have been drowned in 1350 while trying to save a friend during a great flood in Schachen River. In 1387 Tell's chapel was built in his memory. How much of this famous story of Tell is true is not known. Schiller used the story in his drama of *William Tell.*

Tel'ler, Henry Moore, United States senator, lawyer and Republican politician, was born at Granger, Allegany County, N. Y., May 23, 1830, and educated at Rushford Academy and Alfred University (LL.D. 1886). On studying law and being admitted to the bar, he practiced in Illinois, then removed to Colorado, where he was elected to the United States senate, and was secretary of the interior in President Arthur's cabinet (1882-5). Since 1885 he has continued to represent his state in the United States senate, but is now politically a Democrat, having in 1896 withdrawn from the national Republican convention at St. Louis in that year in consequence of the financial plank in its platform adverse to free silver.

Temiskaming, Lake, on upper Ottawa River (Ontario), is attracting much attention. One million acres of excellent arable land have been surveyed and are open for settlement. The district is well watered by Blanche, Montreal and Wabbi Rivers and their tributaries. Thousands of settlers have already taken locations. Temiskaming Railway passes through the district. It runs through the rich silver-deposits of Cobalt (*q. v.*). The town of Cobalt is on the line. Haileybury, only three miles distant and situated on the lake, also is on the railway. The present terminus of the railway (government-owned) is Englehart, 138 miles from North Bay, on White River.

Tempe (*tĕm'pē*), **Vale of,** a narrow valley or gorge, about four and a half miles long, in the northeast of Thessaly, between Mounts Olympus and Ossa. The Peneus flows through it. The classic poets praise it for its matchless beauty, and travelers to-day speak of the wild grandeur of its scenery.

Tem'perance. See TOTAL ABSTINENCE.

Tem'perature. The following statements from Maxwell's classical volume on *The Theory of Heat* put the matter as clearly and concisely as, perhaps, is possible.

"Definition of Temperature.— *The temperature of a body is its thermal state considered with reference to its power of communicating heat to other bodies.*

Definition of Higher and Lower Temperature.—*If, when two bodies are placed in thermal communication, one of the bodies loses heat and the other gains heat, that body which gives out heat is said to have a higher temperature than that which receives heat from it.*

Corollary.—*If, when two bodies are placed in thermal communication, neither of them loses or gains heat, the two bodies are said to have equal temperatures or the same temperature.*

Law of Equal Temperatures.— *Bodies whose temperatures are equal to that of the same body themselves have equal temperatures.*" See THERMOMETER.

Tem'pest, The, a play by Shakespeare, was first acted in 1610. It seems to have been written for private performance, being a third shorter than his average plays. It has been suggested that its present form is an abridgement by Beaumont about 1613, for rendition at the wedding of Princess Elizabeth. It seems to be one of Shakespeare's latest works, first printed in the folio of 1623. Its sources principally are

books of travel. It has no basis in the life of the times. Two characters, Caliban and Ariel, lie outside the bounds of humanity. The drama represents an enchanted world summoned into existence by the magician's wand and ready to disappear at his bidding. There is no strongly dramatic situation. Prospero is in full control; power and right, evenly paired, work together.

Tem'plars, Knights, a celebrated religious and military order, founded at Jerusalem in the beginning of the 12th century by Hugues de Paganes, Geoffrey St. Omer and seven other French knights for the protection of the Holy Sepulchre and the pilgrims who visited it. Baldwin II, king of Jerusalem, gave them their first home; and another building was obtained from the abbot of the church and convent of the temple, because of which they were called Templars. Each Templar was allowed three horses and an esquire. They obeyed strict rules, and at first were proud of their poverty. When the Saracens captured Jerusalem, the Templars spread over Europe; their bravery became celebrated everywhere; money and lands were showered on them; and members of the greatest families were proud to be enrolled in their number. In every country where they were they had their governor, called the Master of the Temple.

The Templars at first were all laymen and of noble birth. Pope Alexander III, however, in 1162, had chaplains taken into the order, who did not adopt the military vows; and laymen not of noble birth afterwards joined as serving-brothers, some attending the knights and some working at trades in the houses and on the lands of the order. Many also joined merely to gain the protection afforded them. As the Templars grew in power, they became luxurious, proud and independent of law and authority. Philip IV of France seized and imprisoned all the members of the order on whom he could lay hand, confiscated their lands, and put many to death for alleged crimes. The English Templars were treated by Edward II in much the same manner, except that their punishment was confined to the loss of their possessions to the king. In 1312 the order was finally suppressed by the council of Vienne, the greater part of their property being bestowed on the Knights of St. John.

The Templars' uniform was white, with a red maltese cross on the left shoulder. Their banner was white with black stripes, and was called *beauséant*, the name then given to a horse marked with black and white. *Beauséant* also became their battle-cry. See Addison's *History of the Knights Templars.*

Tem'ple, Tex., a city in Bell County, on the Gulf, Colo. and Santa Fé and the Mo., Kans. and Texas railways, 35 miles southwest of Waco and about 60 northeast of Austin. It has a Carnegie Library, and, besides its municipal buildings, churches and schools, also has the King's Daughters' Hospital and the Railroad Hospital of the Gulf Railroad. Settled in 1881, it was incorporated a city in 1884. Its industries are many and growing; they include flour and cottonseed-oil mills, cottongins and compresses, machine-shops, foundries, bottling-works, a cold-storage plant and a candy-factory. It ships extensively of live stock, besides fruit, corn, oats and cotton. Population 10,993.

Temple, Frederick, late Archbishop of Canterbury, was born in Leukas, in the Ionian Isles, in 1821; and died in London shortly after he had performed the ceremoney of the coronation of Edward VII. He was a distinguished graduate of Balliol College, Oxford. He was successful in turn as head of the Knellar Hall Training-School, as inspector of schools and as headmaster of Rugby. His essay in *Essays and Reviews* was regarded by some as more liberal than orthodox. In 1869 he became Bishop of Exeter, in 1885 Bishop of London and in 1896 Archbishop of Canterbury. Temple was an orthodox prelate, a learned writer and a man of the highest character.

Temple of Karnak, The kings of the new empire put all their energy into building temples rather than palaces. The ruins of this period are scattered about Thebes over an area of 2¼ miles north and south and 3½ east and west. The most important and magnificent group is at Karnak on the right side of the Nile. It consists of one principal temple and five or six smaller ones arranged loosely about it, with seemingly little or no regard for symmetry. All the temples of this period were very similar in construction, having an inner sanctuary or *sekos*, a hall of assembly containing two ranges of large columns in the center and one or more rows of smaller ones on the outer side of the central columns. Light was admitted over the lateral columns (this is called a hypostyle hall); sometimes light was admitted over low stone-screens between the columns of the front row of the hypostyle; in such a case all columns were of equal height. In front was a large forecourt, surrounded by a row of columns at the entrance of which was a double pylon or gate, formed like an oblong, truncated pyramid with flaring cornices, masts and banners and iron stocks for blazing torches in the night. Colossi of seated figures hewn in stone usually decorated the front. The building began with the erection of the *sekos* or sanctuary which was to contain the shrine of the deity and the sacred chamber. Rooms for the priests and the performance of various rites and

ceremonies were adjoining. **Karnak** is the greatest and most important of all the temple-palaces, for such in reality they were, being built by the king for the worship of the god and also for royal ceremonies and festivities. "The temple of Karnak perhaps is the noblest effort of architectural magnificence ever produced by the hand of man." (J. Fergusson.) Its construction extended over 2,000 years and was the work of 21 kings. It is 1,200 feet long and about 360 in width, the great hypostyle hall being 340 ft. by 170 ft. The sanctuary or inner part was originally built by Osortasen (12th dynasty). Amenophis (the first of the restored race) enclosed it in a greater temple measuring 120 feet square. In front of this Thothmes built a magnificent hall backed by piers and surrounded by colossal statues. Back of it Thothmes III erected a peculiar building in comparison with the rest, 140 feet long and 55 feet wide. It consisted of two rows of massive, square columns which supported the roof on the outer sides while in the center the roof was raised and supported by taller but circular columns with reversed capitals. This is similar to the buildings of Assyria but quite unlike Egyptian ones. The progress of construction was brought to a standstill by the sun-worshippers in the 18th dynasty, but was resumed by Menephthah who started the great hall, "the masterpiece of Thebes." It covered 59,500 square feet, and contained 150 columns 8 to 10 feet in diameter, ending in a capital of flowering lotuses and rich in colored design.

Rhamses I of the 19th dynasty built a small temple in front of this, and the great court was added by the kings of the 22nd dynasty. The building was now complete as we find the plan of the whole in the ruins of to-day. There were 12 entrances to the temple, the most important of which were the one that opened to the boat-landing on the Nile at the northwest and the great gate on the south that gave access from the avenue, which was a mile and a half long and lined on each side with sphinxes, that connected with the temple of Luxor. But this gate was surpassed in grandeur by the former. From the boat-landing on the Nile, a mile distant, an imposing roadway of sphinxes led to the wall of the great court, connected with it by a court containing four obelisks and colossi of the king. The entrance to this was flanked by huge pylons of stone, 180 feet high and decorated with inscriptions, flat designs and sculpture in flat and in high relief. It was painted with brilliant oriental colors. Within this a row of columns led to a second pylon which formed a gateway or entrance to the great hypostyle hall, and was treated in the same manner as the former ones. Avenues of sphinxes led from similar gateways to the surrounding temples. Consult Jas. Fergusson: *History of Architecture;* C. T. Matthews: *The Story of Architecture;* and Perrot and Chipiez: *History of Art in Ancient Egypt.*

Temple of Luxor, The, is next in beauty and importance to Karnak and is in its vicinity. Being built very near the Nile may account for its destruction; yet it may not have been finished. It is ruined; and the materials have been carried away. The utter disregard the Egyptians had for regularity and symmetry is plainly to be seen in this temple. There is a considerable angle in the axis of the whole structure, and right angles in the angles of the court-yards are rare. The columns are irregularly spaced, an irregularity which seems to have vitiated their whole scheme of building. It is 830 feet long, has a width varying from 100 to 200 feet, and is much simpler than Karnak, being built by only two kings, Amenophis III erecting the southern part containing the sanctuary, royal apartments etc., and Rhamses the Great, the northern part, consisting of a large fore-court deflecting from the major axis of the building and facing the temple of Karnak, with which it was connected. A large hall adjoining this and similar to the hypostyle hall at Karnak is attributed to the latter king. The floor of this hall is raised a few feet above that of the court and is reached by a flight of steps. In front of the huge pylon at the entrance of the great court are two colossi of Rhamses the Great, and two obelisks formerly were there also.

Ten'dril, an organ developed by many climbing plants as a holdfast. Tendrils may be modified branches, leaves or parts of leaves. In every case they are very sensitive, and have the power of rapid coiling or contraction when they come in contact with a support. In the grape-vine, when the tendrils reach a support, they coil about it, and growing unequally are thrown into spirals, thus drawing the vine toward the support. Sometimes a tendril has a sucker-like disk at its tip. When the disk becomes fastened to a support, the straight tendril becomes a spiral, and the plant is drawn toward the support. The stimulus which calls forth this response of the tendril is known as the contact stimulus.

Ten'ements. A tenement, properly, is any house constructed for the separate living of more than one family; but the term usually is applied only to the poorer classes of apartment-houses. In our large cities millions dwell in such houses under dreadful conditions. Our country is especially liable to the evil, because deluged with immigrants of a low standard of living and because slow to interfere by laws with the greed and wickedness of individuals. In consequence, while in the rest of the world the densest population occurs in

some parts of Bombay, where 759 Hindus crowd on a single acre, in New York City, in one part, 1,000 men, women and children are herded on one acre. In the worst part of the slums of London the proportion is but 365 to an acre. The time to prevent overcrowding is when the city is building, and suburban lots can be secured with comparative cheapness. The results of such overcrowding are disease, immorality and loss of efficiency, as well as mere misery. During 1894–1903 there were about 500 cases of tuberculosis from one block occupied by 4,000 people. The history of one room shows that, shut out from the healthy action of light, it had given the dreaded disease to family after family. Four times as many children die in these houses as in the average. In Berlin it was found that the death-rate (1885) for families that live in one room was 163 per thousand, but for those that have four rooms or more only 5.4 per thousand. Families living together in one room lose decency, and the children are driven to the streets on hot nights to escape the room. Children grow up with impaired vitality and impoverished minds.

The remedies for such conditions are, first, wise land-laws to keep people from crowding to the towns, advances of money to intending farmers and educating boys and girls to live in the country; second, to improve town-buildings and improve the means of getting from the suburbs to the places of work. England has done much to cheapen suburban travel. London has spent over $10,000,000 to build cottages for workmen and buy and rebuild badly built districts. Glasgow has rebuilt over 83 acres, and thereby reduced the death-rate to a fourth of what it was. The city has repaid itself out of the rents, and improving the public health enriched the public purse. In Berlin the laws are compelling landlords to build decent houses, and make the burden of taxation lightest on houses fit for workingmen. In Belgium the fare on suburban railroads has been reduced to 36c a week for a workman going 20 miles each way, daily. In Italy workmen are encouraged to build their own houses by a remission of taxes for five years on such houses. In New York some bad blocks of tenements have been purchased and turned into parks and playgrounds and schools. Several laws as to tenements have been passed by the state, and New York City has a special department to deal with tenements. Following an English example, Alfred T. White in 1877 put up model dwellings for workingmen, and has received 7½% on his investment. Other attempts of this kind have been made with success. But the immediate relief that would come from holding landlords responsible, from proper inspection and from swift correction of the evils, such as is secured in Berlin, no American city has yet secured. Consult *Charities and Commons*, 1907, especially for May 4 and Sept. 7.

Ten'erife'. See CANARIES.

Teniers (*tĕn'yĕrz*), **David, The Younger,** was born at Antwerp in 1610. His father, also a well-known painter, gave him his first lessons in art. He soon showed a genius, greater than his father's but in the same line, as a colorist and painter of the scenes and incidents of ordinary country-life. He became the most popular of Flemish painters, and was kept busy to meet the demand for his pictures. The governor of the Spanish Netherlands made him gentleman of his bedchamber, and the king of Spain set apart a special gallery for his works. In spite of the number of his paintings — over 1,000 — they bring very high prices. Among them are *The Village Wedding*, *The Bagpipe-Player* and *The Misers*. Teniers died near Brussels, April 25, 1690.

Ten'nessee', the third state admitted into the Union after the adoption of the Federal constitution. Its greatest length is 432 miles, its greatest breadth 109, and it covers 42,050 square miles. It is bounded on the north by Kentucky and Virginia, on the east by North Carolina, on the south by Georgia, Alabama and Mississippi and on the west by the Mississippi. Varying physical conditions divide Tennessee into sections. West Tennessee reaches from the Mississippi to Tennessee River; middle Tennessee stretches eastward to the middle of the Cumberland plateau; and eastern Tennessee covers the rest of the state.

Surface and Resources. The Mississippi bottoms, covering 1,000 square miles, are bordered on the east by a table-land covering 9,000 square miles and reaching to the Tennessee valley. In middle Tennessee, beyond the river-valley, lies the garden of Tennessee, a rich plain of 5,450 square miles, like the bed of a drained lake, surrounded by a rim 300 feet high, filled with grain, cotton and tobacco fields and the largest red-cedar forests in America. There are, all told, 27,300 square miles of woodland. Eastward of the garden is the great Cumberland plateau, 1,000 feet above the Tennessee, rich in coal and limestone. The coal-field covers 4,400 square miles of the Cumberland plateau. There also are lead and zinc mines, marble, kaolin, limestone and granite quarries, phosphate-rock, slate, copper, sandstone, petroleum and iron-ores. The eastern Tennessee valley separates the plateau from the Alleghanies, a belt seven to 28 miles wide including the Chilhowe, Great Smoky, Bald and Unaka ranges. The highest peak is Clingman's Dome (6,660 feet). Among the Cumberland Mountains are caverns many miles long, in which are powerful underground streams and bones of extinct animals. Elsewhere in Tennessee are

mysterious sink-holes, through which the waters drain into underground streams. The chief rivers are the Tennessee, which twice crosses the state, the Cumberland, the Holston, the French Broad and the Big Hatchie.

Occupations. Agriculture is an important industry, and a variety of crops are produced. The leading crop is corn, but tobacco also is important. Other products are wheat, oats, potatoes, sorghum, peanuts and cotton. Fruit-trees and small fruits are grown, and stock-raising is also practiced. The presence of raw materials and the abundance of coal render manufacturing very important. The industries include iron and steel making, foundry and machine-shop products, the preparation of leather and tobacco, flour and lumber mills and the manufacture of textiles, cotton-seed-oil and cake and clay-products. Iron is largely mined, and the pig-iron product is very valuable. Copper is quite extensively produced, and other lines of mining are zinc, lead, phosphate-rock, marble and building-stone.

Education. In several counties education is compulsory, and throughout the state it is illegal to give employment (in factory, mine or workshop) to children under 14. Separate schools are maintained for white and colored. The governor appoints a board of education and the superintendent of public instruction, who also is secretary of the board. There are county and city superintendents besides. There is an enrollment of 521,753 children, and more than 10,000 teachers are employed. The state maintains 3 normal schools and seven private normals are in operation. The University of Tennessee at Knoxville, opened in 1807; the University of Nashville at Nashville; Grant University at Chattanooga; the University of the South at Sewanee; Vanderbilt University at Nashville, endowed with $1,000,000 by Commodore Vanderbilt; and Fisk University at Nashville, for colored students are among the many colleges where higher education is provided. The state maintains several benevolent institutions, and many are provided by private and ecclesiastical charity.

History. Probably De Soto was the first white man to enter Tennessee. A settlement of North Carolinians, made in 1754 was broken up by the Indians. Two years later Fort Loudon was built on the Tennessee 30 miles from the site of Knoxville. The massacre of the garrison in 1760 was followed within a year by the defeat of the Indians and a treaty allowing settlements to be made. At first a territory of North Carolina, the dissatisfied frontiersmen organized the state of Franklin, which lasted from 1785 to 1788, when it was put down by North Carolina. Tennessee was admitted as a state in 1796. The different capitals have been Knoxville, Kingston, Murfreesboro and Nashville, the present capital. The first railroad was the Memphis Railroad, chartered in 1831, when there were only 50 miles in the country; there are now 3,815 miles, mostly built since the Civil War. There are 349 miles of electric lines. Tennessee seceded on June 8, 1861, and was readmitted in 1866. Many of the hardest-fought engagements of the war took place on Tennessee soil, as at Forts Henry and Donelson, Island No. 10, Murfreesboro, Chickamauga, Lookout Mountain, Franklin and Nashville. Population 2,296,316. See J. B. Kellebrew's *Resources of Tennessee.*

Tennessee, a river of Tennessee, is one of the largest branches of the Ohio, which it enters at Paducah, Ky. Clinch and Holston Rivers rise in southwestern Virginia, and in eastern Tennessee unite to form the Tennessee. The river first flows south, going 300 miles in Alabama, turns north, and crosses Tennessee and Kentucky. It is 800 miles to the junction of the two rivers at Kingston, Tenn., but 1,100 miles to the source of the Holston, its longest branch.

Tennessee, University of, now at Knoxville, was established in 1794 as Blount College. In 1807 it became East Tennessee College, in 1809 East Tennessee University, in 1879 the University of Tennessee. It is connected with the public schools and is coëducational. The trustees are nominated by the board of trustees and elected for life by the legislature, the governor, however, the secretary and the superintendent of schools being members *ex officio.* The university consists of a college of agriculture and of mechanical arts and of a university department. The college includes agricultural, educational, engineering, industrial and literary departments, their courses being substantially the same as those in other colleges. But the industrial department is for negroes, and is in Knoxville College. The university consists of the academic, educational, legal, medical and dental departments, the last two being at Nashville. Military science and drill are parts of the course, and are required studies for male Freshmen and Sophomores. The agricultural department organizes farmers' institutes, and the university has a farm and the state's agricultural experiment-station. The faculty numbers 157, the students 850, the library 26,000 volumes. The university controls the congressional land-grant of 1862 to Tennessee, and its income is about $125,000

Ten'nis, a game of obscure origin, but certainly as old as the 14th century, when it was played chiefly in France. At present the name is applied to lawn-tennis, a modern game that arose about 1875. It is played with rackets and balls on courts of asphalt, cinder, grass or gravel. The court is divided midway by a net three feet high at its cen-

ter and three and a half at the posts that support its ends. The court is 78 by 27 feet in area when two people play, but 78 feet long and 36 wide when four play. The object is for one player on one side of the net to knock the ball into the other players' part of the court in such a way that it cannot be returned. The racket consists of a tightly-strung, flat net of gut; the balls, of rubber thinly covered with white flannel or felt. White lines are traced on the court to indicate the base-lines, each 39 feet from the net; the side-lines 78 feet long, connecting the base-lines; the service-lines, each 21 feet from the net; and the half-court line, half-way between the side-lines, parallel to them and dividing the space on each side of the net into the right court and the left court. So the whole court consists of two half-courts, and these each of a right and a left court. One player takes the ball, stands with one foot on the base-line, the other behind, throws the ball into the air and strikes it in order to drive it, not into the opposite court, but into the court *diagonally* opposite. The other player must hit it on the first bound and return it into the first player's territory. If he does not, the first player, called the server, scores a point which is counted as 15. But if this second player, called the striker-out, return the ball to the server and *he* fail to return it again, the striker-out scores 15. In this way the game goes on under rules of its own, the second point for either player making the score 30, the third 40, and the fourth winning the game, unless *each* player has scored 40. In this case the score is called deuce, and *two* points must be *consecutively* scored for winning the game. When either player has won six games consecutively, a set has been played. But if each has won *five*, the set is deuce and *two* consecutive games must now be won. Serving the ball is done by each player in turn, but courts are exchanged between them only at the end of a set. Three or four players play essentially as do two.

Ten'nyson, Alfred, an English poet, was born at Somersby, Lincolnshire, Aug. 6, 1809. At Trinity College, Cambridge, where he studied, he gained a medal for a poem called *Timbuctoo*. His first publication, *Poems by Two Brothers*, was written in connection with his brother Charles, and so great an authority as Coleridge pronounced only the poems marked C. T. to have marks of poetical genius. A volume containing *The May-Queen*, *Mariana*, *A Dream of Fair Women* and *The Lotus-Eaters*, was followed by another collection, which included *Locksley Hall*, *Morte d'Arthur*, *St. Simon Stylites* and *Ulysses*, and from that time Tennyson easily held his place as the first of modern English poets. His great work, *In Memoriam*, is a series of poems on death, immortality and kindred themes, suggested by the loss of Arthur Hallam, his friend. It was first published without Tennyson's name in 1850. The *Ode on the Death of the Duke of Wellington* and *The Charge of the Light Brigade*, one of his most popular poems, were written as poet-laureate, a position in which he succeeded Wordsworth in November, 1850. *Maud*, published in 1855, was longer in winning public favor than most of Tennyson's work, but the *Idyls of the King* (*q. v.*) met with an enthusiastic reception. The first series consists of four stories in verse: *Enid*, *Vivien*, *Elaine* and *Guinevere*, to which a second series was added which included *The Holy Grail*, *Gareth and Lynette*, *Pelleas and Etarre*, *The Last Tournament* and *The Passing of Arthur*. They are the consummate form into which one of the greatest poets of the 19th century wrought those Arthurian legends which have haunted English romance for 700 years. *Enoch Arden* appeared in 1864; *Queen Mary* in 1875; *Harold* in 1876; *Becket* in 1884; and *Demeter and other Poems* in 1889. Tennyson lived a retired life, spending a large part of his time at his place on the Isle of Wight. He wrote carefully, altering and improving his poems, until they attained the perfect form in which they were given to the public. He received large sums of money for his later work, in some instances being paid as much as $50 a line. His poems have been translated into German and Spanish. In 1883 he was made a peer. He died at Aldworth, in Surrey, England, Oct. 6, 1892. One of his last poems, *Crossing the Bar*, was used in the services at his burial in the poets' corner of Westminster Abbey. Consult Hallam Tennyson's *Alfred, Lord Tennyson;* Stedman's *Victorian Poets* and Frederic Harrison's *Tennyson, Ruskin and Mill.*

LORD TENNYSON

Terence (*tĕr'ĕns*), **Publius Terentius Afer,** a Latin poet, was born at Carthage about 195 B. C. He was a freed slave, and was educated by his master, a Roman senator. His first play, *Andria*, was brought out in 166 B. C., and was so successful that he had the best young men of Rome for friends. When in Greece he translated 108 of Menander's comedies, and his death is commonly thought to have been due to grief at the loss of his translations. He has left six comedies: *The Woman of Andros*, *The Stepmother*, *The Self-Tormentor*, *The*

Eunuch, The Brothers and *Phormio.* The most popular is *The Eunuch.* They have been translated into most European languages. He died in 159 B. C.

Terhune (*tĕr-hūn'*), **Mary Virginia,** American novelist, familiarly known by her pen-name of Marion Harland, was born in Amelia County, Va., Dec. 21, 1831. Her maiden name was Hawes, and in 1856 she married the Rev. Edward Payson Terhune. At an early age she began to write for the magazines, conducting *The Home-Maker* and *Babyhood* and contributing to *Wide-Awake* and *St. Nicholas.* Subsequently she resided in Massachusetts, but finally settled in New Jersey, where she has long been an untiring and helpful writer on themes connected with cooking, household management etc. Among her works are *The Story of Mary Washington, Common Sense in the Household, Common Sense in the Nursery, The Cottage Kitchen, Breakfast, Luncheon and Tea, Some Colonial Homesteads, Literary Hearthstones* and *Marion Harland's Complete Cook-Book.*

"MARION HARLAND"

Tern, a water-bird with forked tail, related to the gulls. These beautiful birds, usually with gray and white plumage, are common in harbors. They are most graceful birds, and it is to be regretted that of late years they have been killed in immense numbers for trimming ladies' hats. There are about 50 known species of terns. They are coast-birds rather than open-sea birds, like the gulls. The common tern or sea-swallow is abundant on the Atlantic coast. It is about 15 inches long. There are a small black tern in the inland waters of North America and a similar form in Europe. See GULL.

TERN

Ter'ra-Cot'ta, unglazed, earthen ware, made of clay and hardened by burning. It generally is a dull red or buff in color. In England the materials used are clay, fine quartz-sand and finely pulverized, old pottery. It is used for statues, fonts, fountains, drain-tiles and ornaments for houses. The Greeks, Romans, Assyrians and Babylonians used it, manufacturing molds, statuary. vases and lamps. Often the articles were ornamented with designs of men, animals, fruits or flowers.

Terra del Fuego. See TIERRA DEL FUEGO.

Ter'rapin, the name broadly applied to small turtles belonging to a family of pond-turtles (*Emydidæ*). It is frequently restricted to the salt-marsh terrapin or diamond-back turtle of the Atlantic coast, which is highly prized as food. The region whence the diamond-back terrapin is chiefly taken is Maryland, although it is captured from New York to Texas. It is caught in great numbers in the summer and kept in pens for winter. It is about eight inches long; swims well; and runs well on land. The red-bellied terrapin, ranging from New York to Virginia, is often substituted, but the flesh is of inferior quality.

TERRAPIN

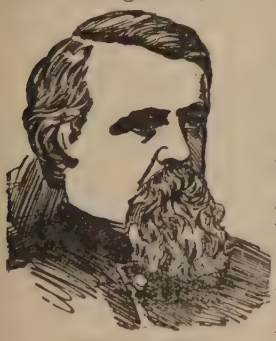
Terre Haute (*tĕr're hōt'*), **Ind.,** county-seat of Vigo County, is upon the east bank of Wabash River on Fort Harrison prairie. It is 73 miles west of Indianapolis and almost equidistant (175 miles) from Cincinnati, Chicago, St. Louis and Louisville. The town was laid out in 1816 and has had a steady growth. Its principal buildings are Indiana Normal School, with over 12,000 students, Rose Polytechnic Institute, St. Mary's-of-the-Woods, for girls, and the high school, with 1,100 students. There are 26 public-school buildings and two commercial colleges well attended. There are nearly 325 teachers and about 7,500 children attending school. There are 48 miles of paved streets and 25 miles of electric car-line. The streets are well-lighted by electricity, and many fine business blocks and private residences line the avenues. The manufacture of glass is one of the principal industries. The great coal-beds underneath the region in which Terre Haute is located furnish a quality of coal from which producer-gas is made, which is cheaper and better than natural gas for manufacturing purposes. Among many other industries whose total exceeds $30,000,000 in yearly value, may be

named rolling-mills, stamping-works, car-shops, wagon, tool, brick and tile works, hominy and flour mills and several distilleries. The distilling plants are among the largest in the country. The population of Terre Haute is 64,000.

Ter'rell, Tex., an important city of Kaufman County, is 32 miles from Dallas, in a fine agricultural section. Among its industries are a cotton-oil mill, cotton-gins, a cotton-compress, flouring-mill, creamery, grain-elevator, iron and brass foundry, brick-works and the shops of the Texas Midland Railroad. Terrell has fine school-buildings, thorough course of study and North Texas University School (Meth. Epis.). It has good public buildings and several churches and North Texas Hospital for the Insane. It has all the facilities of a modern city, the service of two railroads and a population of 7,050.

Ter'rier (Latin *terra*, the earth; French, *terrier*, a burrow), a small, unsually shaggy-haired dog, but of many varieties. It is kept and bred by dog-fanciers, either as a pet or to kill rats and other vermin in their burrows or holes in the earth. The chief breeds are the Skye, Dandie Dinmont, fox and other Scotch varieties; the English bull-terrier, black and tan, the Airedale, Bedlington, Welsh and Irish breeds, besides the Boston terrier etc. In height the terrier stands from eight to 16 inches (the hairy Scottish kinds being generally low in stature), with a weight from 14 to 24 lbs. or, in the case of the heavy bull-terrier, with a weight of 50 or more pounds. The Maltese is another variety, of the lap-dog species. See among other authorities F. T. Barton's *Terriers, their Points and Management*, London, 1907.

Ter'ry, Alfred Howe, an American soldier and general, was born at Hartford, Conn., Nov. 10, 1827, and died at New Haven, Conn., Dec. 16, 1890. After studying and practicing law he became colonel of a militia regiment in Connecticut, and on the outbreak of the Civil War his regiment was mustered into the United States service and took part in the first battle of Bull Run. Colonel Terry was present at the capture of Port Royal, at the siege of Fort Pulaski and in the operations against Charleston. He was promoted to brigadier-general, shared in the capture of Fort Wagner, and acted in Virginia in 1864 as division and corps commander. He served at Drury's Bluff, at Bermuda Hundred, at the siege of Petersburg, but his chief achievement as a soldier was his assault and capture of Fort Fisher (Jan. 15, 1865). After this he served under Sherman as corps-commander, and was at the capture of Wilmington. He was brevetted major-general in the regular army in 1865, and commanded the departments of Dakota and the south, and was in charge of successful expeditions against Sitting Bull and the Sioux.



GENERAL TERRY

Terry, Ellen (Alice) [Mrs. E. A. Wardell], an English actress, was born at Coventry, Feb. 27, 1848, and made her first appearance on the stage with Charles Kean's Shakespearian revivals, in 1858, in *The Winter's Tale* and as Prince Arthur in *King John*. She subsequently joined a Bristol company, of which Mrs. Kendal was a member, and appeared in London in 1863 as Gertrude in *The Little Treasure*, as Hero in *Much Ado About Nothing* and as Mary Meredith in *Our American Cousin*. After her marriage she retired from the stage for a while, but in 1867 reappeared, and later joined Mr. and Mrs. Bancroft's company, acting the part of Portia and touring with Sir Henry Irving as leading lady of his troupe. Her impersonations include Viola in *Twelfth Night*, Ruth Meadows in *Eugene Aram*, Henrietta Maria in *Charles I*, Marguerite in W. G. Will's play of *Faust*, Rosamond in *Becket*, Lucy Ashton in *Ravenswood*, Lady Macbeth in Shakespeare's tragedy of *Macbeth* and others yet. In her repeated American tours she has won deserved praise, and is a welcome favorite of the modern stage.

ELLEN TERRY

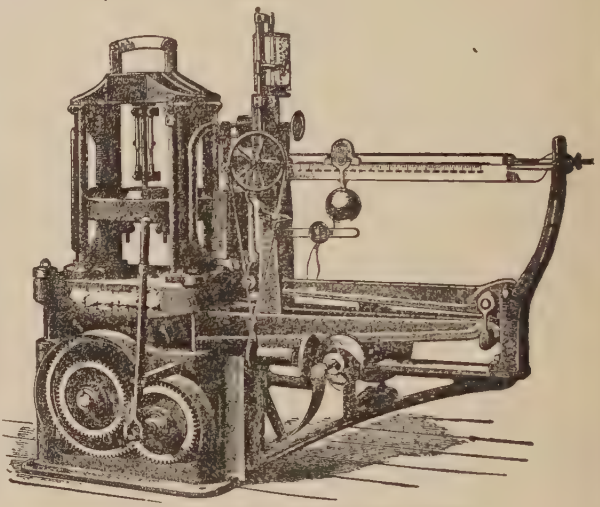
Tes'la, Nikola, electrician, physicist and inventor, was born in Austria-Hungary in 1857, and studied at the polytechnic school at Gratz, the capital of Styria. For a time he was in the government telegraph engineering service, and in 1881 was employed at Paris in one of the large electric lighting companies of that city. In these employments he devoted himself to experiments in

NIKOLA TESLA

electricity and magnetism. On coming to the United States in 1884, he for a time was in the Edison works at Orange, N. J., but afterwards became electrician in the Tesla Electric-Light Company, and established a laboratory at New York for independent research. He is the inventor of the modern principle of the rotary magnetic field embodied in the apparatus used in the transmission of power from Niagara Falls; of new forms of dynamos, transformers, induction-coils, condensers, arc and incandescent lamps; and of the oscillator combining steam engine and dynamo. His researches in electrical oscillation have created a new field of electrical investigation; while he has made many startling innovations and inventions in using currents of high tension. He continues to reside in New York.

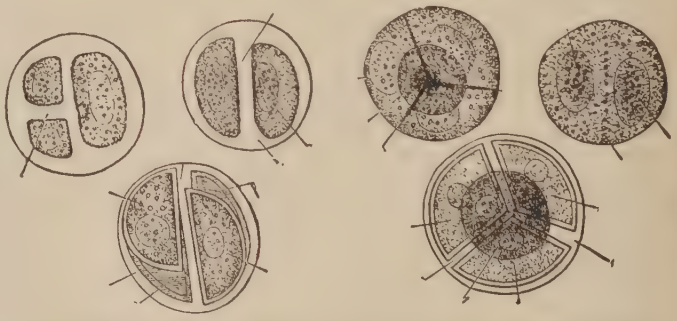
Tes'ta, the seed-coat, which usually is hard and bony. The *testa* is developed by the tissue of the integument of the ovule. Sometimes it develops into two very distinct layers, an outer fleshy layer and an inner hard one. Often it is variously marked and sculptured on the surface, enabling one to recognize the plant from which it has come. In fact, the color and markings of the *testa* are very important guides in the classification of many plants. It is the *testa* also which develops the various tufts of hairs and wings, which are often found on seeds and aid their dispersal by the wind. It sometimes develops hooks and spines, as grappling appendages, to aid in dispersal by animals.

Test'ing-Machine, a machine for testing materials. Testing-machines are arranged so as to apply measured forces to a sample of the material and to observe the corresponding deformation or breaking of the sample. The common tests are stretching, crushing, bending and tension. It is usual to apply the force either by a system of levers or by means of a hydraulic press. The forces are usually measured by a scale-beam. When large samples are to be tested, as long, heavy beams, the machine must be very large. The largest and finest testing-machine ever constructed is that at the Watertown arsenal, belonging to the United States government. It can exert a force of 450 tons, and yet it is extremely sensitive. At the time of its trial a rod of iron five inches in diameter was broken with a measured force of 722,000 pounds and immediately afterward a horse-hair was broken with a measured force of one pound. For loads of 200 pounds it is sensitive to less than one two-millionth of the whole. Testing-machines have so many special forms and appliances that special treatises must be consulted for details. See Unwin's *Materials of Construction.*



AN AMERICAN TESTING-MACHINE

Tetrad (*tĕt'răd*) (in plants). In most of the higher plants each mother-cell organizes four asexual spores within itself. This group of four is called a tetrad. These four sister-spores cling together for a time, and sometimes always, but generally they soon separate from one another. For example, if a very young anther be sectioned and examined under the microscope, each spore-bearing cell (mother-cell) within it will be seen to contain just four forming pollen-grains. This tetrad formation of asexual spores is almost without exception from mosses to seed-plants.



A MOTHER-CELL ORGANIZING FOUR SPORES WITHIN ITSELF (A TETRAD).

Tet'raspore (in plants), the asexual spore of red algæ. It is so named because each

sporangium produces just four spores. See RHODOPHYCEÆ.

Teu'tones, a tribe of ancient Germany living on the Baltic Sea. They were a powerful tribe, and with their neighbors, the Cimbri, invaded the Roman republic near the close of the 2d century B. C., and were almost destroyed by Marius (102 B. C.) The name is now given to all ancient German races.

Tex'arkan'a, Ark., and **Tex.,** two neighboring cities on the boundary between Arkansas and Texas, one in Bowie County, Tex., the other in Millie County, Ark., on the Texas and Pacific; St. Louis, Iron Mt. and Southern; Kans. City, Pittsburg and Gulf; and St. Louis Southwestern railways, 64 miles north northwest of Shreveport, La., and 145 southwest of Little Rock, Ark. The two cities, though adjoining and on the same railroads, have distinct municipal governments, and each has a large trade in cotton, cottonseed-oil, sewer-piping and lumber. The industrial plants of the combined cities embrace railway-shops, furniture and pottery works and lumber-mills. The local post-office is on the state line between the two towns, while there are two city-halls and public offices, and each has its own school organizations. Combined population 15,405.

Tex'as, the largest state in the Union, is four times as large as New England, larger than France, Germany or Austria, and equal to six New Yorks or seven Ohios. Its greatest length is 825 miles; its greatest breadth 740; and its area 265, 780 square miles. If the whole population of the American republic were to be carried to Texas, it would be no more densely settled than Massachusetts is now. Population 4,472,494.

Topography. The coast is 375 miles long, in the shape of a crescent, fronted by lines of long islands of white sand, with the Gulf of Mexico on one side and deep and navigable bayous and lagoons on the other, reaching up among the cotton and sugar plantations. There are only four harbors with lighthouses in this long stretch of coast; the United States government has spent many millions in building jetties at Galveston, Sabine Pass, Aransas Pass and other places. In the southwest Padre Island runs northward from the mouth of the Rio Grande for 100 miles; and inside it (between Padre Island and the Texas coast) is *Laguna de Madre*, 90 miles long and eight wide. This lagoon is so salt that fish die on entering it, and on its shores lie the deposits which furnish most of the salt used in Texas. Most of the Texan rivers fall into the Gulf of Mexico, among them the Rio Grande, Brazos, Colorado, Sabine, Trinity, Nueces, San Antonio and Guadalupe. Three rivers form parts of the state's boundary—the Rio Grande, Red and Sabine. The main branch of the Rio Grande is the Pecos. Between the Rio Pecos and the Rio Grande are the Guadalupe, Charrote and other mountains, in whose valleys the rivers die and vanish and the bitter salt-lakes are the only water.

Resources. The resources are numerous, and vary in the different sections. Inland from the coastal plains stretch the midlands, some 200 miles wide. The region called eastern Texas, from 96° W. to Louisiana, covers 50,000 miles, with great forests of pine, oak, cypress, magnolia etc. The rich black prairies reach from Laredo to Denison, a belt from 30 to 60 miles wide. Western Texas lies between Colorado and Nueces Rivers, a bare rolling-prairie of 50,000 square miles, mainly occupied by cattle and sheep ranches. Much like it is southwestern Texas, a tract of 30,000 square miles, between the Nueces, the Rio Grande and the Rio Pecos. The Pan-Handle lies between Oklahoma and New Mexico, mainly north of Prairie-Dog-Town River, with 27,000 square miles of land. It is a plain from 2,500 to 4,000 feet high, with some good soil but little water. The staked plain, which enters from New Mexico, is a waterless, grassy table-land. There are famous gold and silver mines beyond the Pecos. The deposits of building-stone contain marble, granite, soapstone and limestone. Coal, copper, salt, gypsum, lignite, cinnabar, sulphur, iron and asphalt are found. Mineral springs exist in several sections, those of Mineral Wells and Sulphur Texas being best known at present. The state has excellent oyster and other fisheries, and petroleum and natural gas are found.

Occupations. Much iron-ore is mined in eastern Texas, and the coal-mines of the state, though not extensively operated, yield over 1,000,000 tons annually. Salt, silver and gold are also mined, and yellow-pine lumber is cut from the eastern forests, as well as ash, gum, oak etc. Building-stone and cinnabar are quarried, and petroleum produced to the extent of 12,567,897 bbls. annually. Farming and ranching occupy many of the people, and beef, cotton, wool, cotton-seed, hides, corn, oats, wheat, sugar, rice, tobacco, vegetables and fruits are grown. Texas leads all states in the production of cotton, and as a rice-producer is second only to Louisiana. There is a great livestock industry, including cattle, horses, mules and swine. The wool-clip is very valuable. Manufactures are young, but there are over 5,000 specified manufacturing establishments. These include flour, cotton-seed-oil and cake, meat-packing, oil-refining, cigar and tobacco factories, clay-products, foundry and machine work, rice-cleaning, brewing, saddlery and railway-cars.

Education. The Texas school-fund is worth $83,000,000, and nearly 900,000 children attend the public schools and

16,146 teachers were employed. There are many high schools and academies and several colleges, the most important being the University of Texas at Austin, which has an endowment of $5,000,000; Henry College at Campbell; Fort Worth University (M. E.) at Fort Worth; Ft. Worth Polytechnic (M. E. So.); Baylor University at Waco, founded by the Baptists in 1845; St. Edwards' College (R. C.) at Austin; and the Agricultural and Mechanical College of Texas at Bryan, endowed by the United States government. The state has four public normals for white people and Prairie View State College (normal and industrial) for colored citizens. Separate schools are maintained for the races, and educational affairs are under the supervision of a state board of education, a state superintendent and county superintendents.

Charities. There are three state schools for the deaf or blind, three insane asylums, a state orphan's home, an epileptic colony and a Confederate Soldier's Home. The state's penitentiaries are at Rusk and Huntsville; a reformatory for boys at Gatesville.

Irrigation. Irrigation in some sections of the arid portions of the state is a very old agricultural aid. The valley of the Rio Grande has many canals for this purpose that have remained almost unchanged to this day. Since 1900 large canal-systems take water from the Brazos, Trinity, Colorado, Guadalupe and other streams to the rice-fields of southern Texas. Numerous small farms are irrigated from surface-wells, and the irrigation-systems of Colorado and Brazos Rivers are worthy of mention. Orchard-fruits, small fruits, grain and forage-crops have been satisfactorily produced in these localities. The soil wherever irrigated yields abundantly, and is adapted in different sections either to agricultural or subtropical products. (See IRRIGATION.)

Government and Cities. The governor and other officers are chosen every two years; the legislature is made up of the senate and house of representatives. The state capitol building at Austin is the largest one in the Union. The land-office still controls 5,000,000 acres of public lands. Texas has 14,281 miles of railway and 624 miles of electric lines. The chief cities of the state, named in order of population are San Antonio, Dallas, Houston, Fort Worth, Galveston and Austin. Galveston, the chief seaport, was visited by a most destructive hurricane on Sept. 8, 1900. The loss of life entailed by the hurricane was close upon 3,000, while property to the value of about $25,000,000 was destroyed.

History. The Spaniards explored Texas at a very early date. La Salle in 1685 founded Fort St. Louis on Lavaca River. But sickness and the Indian tomahawk blotted out the settlement, and the country was claimed and held by the Spaniards, who founded the missions of Dolores, San Antonio and San Agostino. Indian raids and rebellions, followed by massacres, made Texas a desert, and to people it Mexico invited American colonists in 1820, and within a few years 20,000 had settled there. Many annoynig acts by the officials of Coahuila, of which Texas was a part, resulted in the Americans sending General Austin to ask that Texas be admitted as a state of the Mexican Union. He was thrown into prison, and troops sent to Texas. In 1835 the Texans rose *en masse*, drove out the Mexicans after hard fighting, and proclaimed a republic. The cruel massacre of the garrison of the Alamo (*q. v.*) by President Santa Anna was followed by his overwhelming defeat at San Jacinto by General Houston. The independence of Texas was acknowledged by the United States in 1839. In 1845 it was annexed to the American Union. At once a dispute with Mexico arose over the southern boundary, Mexico claiming to the Nueces, the United States to the Rio Grande. The result of the Mexican War fixed the southern boundary of the United States at the Rio Grande, and the sale by Texas to the United States of lands to the north and west for $10,000,000 settled the detail of the state's boundary as it is to-day. It was also given the right to divide into five states, if its future growth should require it. The state seceded in February, 1861, and was readmitted to the Union in 1870. The name of Texas means Friends and was that of the Indians first living there, whom the Spaniards called *Tejas* or *Tecas*. The nickname of The Lone Star State comes from the flag of the republic of Texas, a white ground with an azure star. See Bancroft's *History of Texas*.

Texas, University of, is at Austin, but its medical department is at Galveston. In 1839 the Texan republic took the first step to establishing this university, in 1858 the legislature of the state provided for organizing it, and in 1876 the constitution appropriated 1,000,000 acres to it. Incorporation came in 1881, and it opened in 1883, when 1,000,000 acres more were given. It is the crown of the Texan school-system, and is coëducational. It is governed by regents appointed by the governor, two every two years, for terms of eight years, the state senate confirming the nominations. It includes the departments of literature, science and arts; engineering; law; medicine (including a pharmaceutical school); and summer-schools. It has also had charge of the Texan mineral survey since 1901. The faculty numbers 140, the students 2,290, the library 60,000 volumes. The productive funds amount to $2,000,000, and the annual income is about $280,000.

Thack'eray, William Makepeace, a great novelist of England, was born at Calcutta, India, in 1811. His father was in the civil service of the East India Company, and dying young left his son a fortune of $100,000. When William was seven, he was sent to England and placed in the noted Charterhouse School, often mentioned in his books. He next went to Cambridge, and in 1831 was at Weimar, where he saw Goethe. His ambition was to become an artist, and he traveled over most of Europe, studying at Paris and at Rome. His drawings were quaint, picturesque and truthful; his art may be seen in the illustrations of his novels, which, as he expressed it, were "illuminated by the author's own candles." But his success in this line did not satisfy him and he tried his hand at writing, much to the delight of readers then and now. He first wrote for *Fraser's Magazine*, in which appeared *The Great Hoggarty Diamond* and *Barry Lyndon*. Most of his capital had been spent in foreign travel and losing investments; he now adopted literature as a profession. His *Snob Papers* and *Jeames's Diary* in *Punch* made him known, but his reputation as one of the greatest of English novelists was made by *Vanity Fair* (1846-8), which disputes the first place among English stories with such books as *Ivanhoe*, *Adam Bede*, *Tom Jones* and *David Copperfield*. In 1849 he published *Pendennis*, one of the best of his books, which tells his own story. His lectures on *English Humorists* and on *The Four Georges* were delivered in America as well as in England. In 1852-5 appeared *Henry Esmond* and *The Newcomes*, his finest works. He also wrote *The Virginians*, a sequel to *Henry Esmond*, in which Washington figures. In 1859 he became the first editor of *Cornhill Magazine*. Thackeray was tall and powerfully built, with massive head, and, as he aged, silvery white hair. He died at London, Dec. 24, 1863. See *Life* by Trollope.

WILLIAM MAKEPEACE THACKERAY

Thales (*thā'lēz*). Greek sage and philosopher, was born at Miletus, Asia Minor, about 640 B. C. and died about 546. One of the Seven Wise Men (*q. v.*) of Greece, he was noted especially as an astronomer and geometer and was the earliest of the Ionian natural philosophers, regarding water as the principle of all things. A remarkable fact concerning Thales is his predicting, so early in the history of astronomical science, an eclipse of the sun, which is alleged to have occurred on May 28, 585 B. C., though doubted on the ground that in Thales' era certain astronomical facts necessary to predict an eclipse with any chance of success were not then known. Some modern astronomers have, however, stated that the prediction of Thales did come true on the date given, and the date agrees with that given by Pliny the Elder in his *Natural History*.

Thallium (*thăl'lĭ-ŭm*), a metal discovered in London in 1861 by the use of the spectrum. It is found in certain iron and copper pyrites, of which it forms about a four-thousandth part, and some in mica. It is generally obtained from the fine dust of pyrites burners. It resembles lead in appearance, is very soft, can be hammered into leaves, tarnishes quickly, gives a green color to a flame, and forms many compounds.

Thallophytes (*thăl'lō-fīts*), the lowest of the four great divisions of the plant kingdom. The name means thallus-plants, the thallus being the characteristic plant-body, which is usually prostrate and has no differentiation of nutritive organs, as the roots, stems and leaves of higher plants. All parts of this body are practically alike. There are two great general divisions of the group: (1) *Algæ*, which contain chlorophyll and hence can manufacture their own food and live independent of any other organisms; and (2) *Fungi*, which do not contain chlorophyll and hence are dependent upon other organisms for their food. Besides the ordinary algæ and fungi the thallophytes contain many forms which are not classified easily, as slime-moulds, bacteria, diatoms etc. The group is an immense one, and contains the minutest of living forms, as well as some which are very bulky, as some of the seaweeds. Thallophytes are of special interest as representing the beginnings of the plant-kingdom, the group from which all the higher forms have been derived.

Thal'lus, the characteristic plant-body of the thallophytes. The thallus-body is also characteristic of the liverworts and of the gametophyte of ferns.

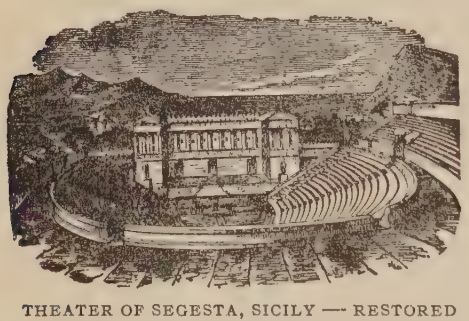
Thames (*tĕmz*), a river of England rising in Cotswold Hills and flowing to the North Sea. It is about 220 miles long, and as far as London, 60 miles from its mouth, is navigable for large vessels. It is 18 miles wide at its mouth, and the tide flows up for 72 miles. The largest river of England, it also is the most important, having as large a traffic, probably, as any river in the world. Its bridges and tunnels at London, its great docks and embankments, are a part of the sights of the city. Canals connect it with the Avon and the Severn, the Sussex coast and the canal system of central England.

Thanks'giving Day, a religious festival peculiar to the United States, resembling the Hebrew feast of ingathering. The

Plymouth colony celebrated the first thanksgiving day after the harvest in 1621, four young men being sent out hunting to make provision for the feast. Such days were appointed after this at different intervals and for various objects in New England and New York. Congress recommended a thanksgiving day yearly during the Revolutionary War, but from 1784 to 1789 there was no national appointment of the festival. In 1784 a day of thanksgiving for the adoption of the Constitution was recommended, and one in 1796 because of the suppression of a riot. For years the festival was almost exclusively a New England institution, celebrated by religious services in the churches, the sermon being often a political address, and by the gathering at the old home of the scattered members of the family. The day gradually became a custom in the western and some of the southern states, each appointing its own day. During the Civil War proclamations for public thanksgiving were issued in 1862, 1863 and 1864, and since that time the day has been regularly appointed by the president of the United States. It usually is observed on the last Thursday in November.

Thayer (*thâr*), **Abbott Handerson,** an American artist, was born at Boston in 1849. He studied chiefly under Gérôme at Paris. His subjects are animals, genre and landscapes, but he has done some wall-painting.

The'ater. The first theater in Greece, the birthplace of the drama, is said to have been



THEATER OF SEGESTA, SICILY — RESTORED

a wagon. The plays of Æschylus were represented on a wooden scaffold. About 500 B. C. one of these scaffolds gave way, and the inventive Athenians at once set about building the famous stone theater of Dionysus. Similar theaters were built in every Greek city, and the ruins of many may be seen to-day. The largest is at Ephesus, and was 660 feet across. These theaters were built with seats in semicircular rows rising one behind and above the other, and were often cut out of solid rock. In the center, at the lowest point, stood the orchestra, in front of the *proscenium* or stage, back of which was a solid wall, called the scene, ornamented with pillars and cornices. There was no roof, but an awning kept off the sun's rays, for the plays were always given in daytime. The Romans, who took the best of everything the Greeks had, built similar theaters of the greatest magnificence, besides their huge amphitheaters. Both in Athens and Rome the theaters were built large enough to seat almost all the citizens, who generally attended in a mass at the expense of the government, for from the time of Pericles plays were made free to all. To enable these audiences of 80,000, 100,000 or more to hear, the actors wore masks with mouthpieces which answered the purpose of speaking-trumpets. Female characters were represented by boys, and it was not till the 17th century that actresses were allowed on the French and English stages. In the middle ages the miracle-plays were played in cathedrals.

The modern theater dates from the 16th century, the first ones being built at Vicenza and Venice. The famous Palais Royal at Paris was built by Cardinal Richelieu in 1639. The first English playhouse was the London theater, built in 1576. About the same time were built the Curtain, Blackfriars and Whitefriars. The first theater in America was opened at Williamsburg, Va., in 1752. The largest and finest theater in the world is the Grand Opera-House of Paris. In China and Japan every little village has its theater. See AMPHITHEATER, DRAMA and MIRACLE-PLAYS.

Thebes (*thēbz*), a celebrated Egyptian city, stands on the Nile, and anciently was the capital of upper Egypt. Its great ruins fill nine townships. The Nile flows through the city and divides it into four quarters. Thebes was at its height from 1500 to 1000 B. C., when it had supplanted Memphis, the ancient capital of the Pharaohs. This City-of-a-Hundred-Gates, as Homer called it, sent out 20,000 war-chariots, was filled with palaces and temples, and contained the cemeteries of the Theban monarchs. Later the capital was moved to Sais and then to Memphis, and Cambyses, the Persian plundered it of $10,000,000. Alexandria was founded, and so its splendor departed. There are now only a few Arab families of *fellahin*, who gain a living by guiding travelers about the ruins or by selling articles rifled from the tombs. The ruins are the most famous in Egypt. Among them are the temple of Karnak (*q. v.*), a mass of obelisks, courts and halls; the Ramesseum (*q. v.*), built by Rameses II, with a broken colossal statue, the largest in Egypt, of that king, weighing 887½ tons; the vocal statue of King Memnon, supposed in early times to make a sound at sunrise; the cemeteries of the sacred apes; and the Valley of the Tombs of the Queens. See Rawlinson's *Story of Ancient Egypt*.

Thebes, the chief city of Bœotia in Greece stood on a mountain-slope between two streams in the southern part of Bœotia.

It is said to have been founded by a colony of Phœnicians under Cadmus, after whom the city was called Cadmeia, a name afterwards applied only to the citadel. Nothing certain is known of the place till its unsuccessful war with Athens in the 6th century B. C. During the Persian War Thebes sided with Xerxes against the other Greek cities, and for this desertion Athens wished to deprive it of its leadership of the Bœotian towns, but it was saved by the interference of jealous Sparta. It sided with Sparta in the Peloponnesian War, but soon afterwards, fearful of Sparta's great power, befriended the Athenians who fled from the oppression of the Thirty Tyrants, and sent a force of its citizens with Thrasybulus and his fellow-patriots to deliver Athens. Thebes became the foremost power in Greece after the long war (379-362 B. C.) in which, under the leadership of Epaminondas, she triumphed over Sparta. Demosthenes induced Athens and Thebes to join hands against the encroachments of Philip of Macedon; but it was too late, and in 338 the battle of Chæronea crushed the liberties of Greece; a second rising was put down by Alexander, who razed Thebes to the ground and sold the whole body of citizens — men, women and children — into slavery. Rebuilt in 315 by Cassander, it was destroyed by the Romans; was again a thriving town in the 11th and 12th centuries; but now has only about 3,250 inhabitants.

Theiss (*tīs*), an important branch of the Danube and the chief river of Hungary, is formed by the Black Theiss and the White Theiss in the Carpathian Mountains on the borders of Galicia. It flows through a mountain-pass, then in a zigzag course past Tokay and Szolnok, and for 300 miles parallels the Danube. It is navigable for large vessels to Szolnok, and is 828 miles long.

Themis (*thē'mĭs*), in Greek story, was the daughter of Uranos and Gæa (Heaven and Earth), the wife of Zeus and mother of the hours, fates, equity, justice and peace. In modern art Themis is represented as Justice with her eyes bandaged, holding a pair of evenly balanced scales in one hand and a sword in the other.

Themistocles (*thĕ-mĭs'tō-klēz*), a great Athenian general and statesman, was born about 514 B. C. In politics he became the rival of Aristides the Just, who was ostracized in 483 B. C., leaving Themistocles the foremost citizen of Athens. To get ready for the coming Persian invasion Themistocles persuaded the Athenians to set apart the proceeds of the government silver-mines for building a navy, believing that the only chance of victory was on the sea. The naval victories of Artemisium and Salamis (480) were won from the Persians chiefly through the efforts of Themistocles, though he allowed the standing claim of Sparta to the chief command, which was given to Eurybiades. The victory at Salamis (*q. v.*) raised his reputation to the highest point. But his popularity lasted only till 471, when he was banished for bribery. The rest of his life was spent at the Persian court of Artaxerxes, where he was greatly honored. See Fyffe's *Primer of Greek History*.

Theocritus (*thē-ŏk'rĭ-tŭs*), a famous Greek poet, a native of Syracuse, who flourished about 272 B. C. About the close of the reign of Ptolemy Soter he visited Alexandria, where his first verses were written. Here Ptolemy Philadelphius became his patron, but later we find him back at the court of Hiero II of Syracuse. For some reason he became dissatisfied with court-life. Turning his attention to the scenes and life of the country, he wrote 30 unexampled idyls of the everyday life of the Sicilian peasantry, which keep their charms of freshness and nature even to the present day. Besides the idyls, a few lines of a poem called *Berenice* and some epigrams are all that are left of his writings.

Theod'olite, an instrument used by surveyors, specially constructed for measuring horizontal and vertical angles by means of a telescope the movements of which can be graduated and marked very accurately. For triangulation-work theodolites are usually made larger and more powerful than transits. In instruments made in this country the graduation is in ordinary degrees of 90 to the quadrant; though those constructed abroad, especially in France, have the centesimal division of 100 grades to the quadrant.

Theodoric (*thē-ŏd'ō-rĭk*) **the Great,** the founder of the kingdom of the Ostrogoths, which embraced Italy, Sicily, southeastern Gaul, Rhætia, Noricum, Pannonia and Dalmatia, was born at Neusiedler Lake, south of Vienna, in 455 A. D. His father, Theodemir, and two uncles had freed their nation from the yoke of the Huns on the death of Attila; part of the Goths had gone to Italy and Gaul; and Theodemir was left sole king of the Ostrogoths in Pannonia. Theodoric spent his boyhood as a hostage at the court of Constantinople, where he was brought up with Emperor Leo's children. After proving himself an able warrior, Theodoric became king of his people in 475. Two wars were now waged against Emperor Zeno, who, to save his capital from the Ostrogoths, urged Theodoric to conquer Italy, then ruled by Odoacer, the usurper. In 488 the young king led the whole nation, some 200,000, across the Alps, won four pitched battles, shut up Odoacer in Ravenna and after a three years' siege, captured both the usurper and the city. Once king of Italy, he governed the peninsula as well as it had ever been ruled under the Roman empire. He protected the Visigoths, checked the Franks and gained Provence. Near the end of his prosperous reign a conspiracy was

discovered in which Boëtius the philosopher, his favorite, seemed to be mixed up. After the supposed traitor had been put to death his innocence was proven, and Theodoric's remorse undoubtedly hastened his death in 526. See BOËTIUS and GOTHS.

Theodosius (*thē'ō-dō'shĭ-ŭs*) **I, The Great,** was of Spanish descent, and was born about 346 A. D. His father was Theodosius, the able general who freed southern Britain from the savage Caledonians. Theodosius accompanied his father in his British campaigns, but after his murder retired to his estate in Spain. From this retreat he was summoned by Emperor Gratianus, who made him his fellow-ruler and intrusted him with the government of Thrace, Dacia, Macedonia, Egypt and the east. Here he found himself face to face with the dreaded Goths, whom his army dared not confront in the open field. By bribes and promises he succeeded in making peace with them; and the magnificent funeral-honors paid to Athanaric, their king, who died at Constantinople, so pleased the Goths that many served in his armies. On behalf of Valentinian II, his brother-in-law, he conquered Maximus, the usurper, and in 392, when Valentinian was strangled by Arbogastes, his general, Theodosius a second time marched on Rome, defeated Arbogastes and became master of the whole Roman world. He had hardly won this vast power, when he died at Milan, Jan. 17, 395.

Theophrastus (*thē'ō-frăs'tus*), a Greek philosopher, born at Eresus, Lesbos, about 372 B. C., died in 288 B. C. He was the disciple of and successor to Aristotle, and for 35 years presided over the Peripatetic school or teaching and disputing school of logicians, who, as they talked, perambulated along the walks of the Lyceum at Athens. Theophrastus was noted for his observational and scientific habits and for his early contributions to botanical science. Though a member of the Platonic circle at Athens, he specially interested himself in researches about plant-life and left a *History of Plants* and the remains of a work dealing with the *Principles of Vegetable Life*. He also wrote a series of sketches of character, which have been taken as models by modern writers.

Theos'ophy, a knowledge of divine things, concerning God and the deeper mysteries in relation to man and nature, having its early source in India and in our day erected into a sort of philosophic system, taught and supposed to be got at by extraordinary illumination. Theosophy to-day has its societies, with a widely extended organization in many countries abroad and at home, treating of soul-science, reincarnation, esoteric matters and what in general is termed occultism. According to the devotees of theosophy much of what they hold and teach formed part of the ancient systems known as Brahamism, Buddhism, Pythagoreanism, as also of the Greek mysteries, the Roman worship of Isis and of later eclectic philosophies, including the mystic teaching embraced in the Jewish Cabbala. In this country theosophy was first propagated by Madame H. P. Blavatsky, a Russian lady, in 1873. Two years later, in conjunction with Colonel H. S. Olcott and Wm. W. P. Judge, she founded a society in New York City, with headquarters subsequently opened at Adyar, Madras, India. The objects of the society were to form "a nucleus of the universal brotherhood of humanity;" "to encourage the study of comparative religion, philosophy and science; and to investigate unexplained laws of nature and the powers latent in man." The society has affiliated organizations in almost all countries, and in the United States it to-day has 69 churches, with 2,663 members. Much literature has been published, including Blavatsky's *Isis Unveiled;* Besant's *Reincarnation* and *Karma;* and Sinnett's *Esoteric Buddhism.*

Theresa (*tē-rē'sà*) or **Teresa** (*tā-rā'sà*), **St.,** was born at Avila, Spain, March 28, 1515. She was noted for her piety when a child, and, when only seven, with her little brother she ran away from home to gain the crown of martyrdom among the Moors. She entered a Carmelite convent at 20, and later founded the order of Barefooted Carmelites. Her reform had the support of the pope, and during her life 29 convents of the reformed order were opened. Theresa was made a saint by Gregory XV, and her feast day is Oct. 15. Her letters and treatises, besides being considered by Roman Catholics as among the most precious of their writings, have also gained a place among Spanish classics. St. Theresa died on Oct. 4, 1582. See her *Life* by Dalton.

Ther'mograph, a device for automatically recording the variations of temperature in a room, factory or greenhouse by means of dials electrically connected with registering thermometers in the building or apartment where the tests of temperature are to be made. The thermograph not only registers the fluctuations in the temperature in a room, but serves incidentally as a fire-alarm, since it is made to sound a gong when the instrument records a temperature exceeding 100° F. See THERMOSTAT.

Thermom'eter, an instrument for measuring temperature. There exists a great variety of thermometers based upon a great variety of principles. But those which are most frequently used are dependent upon the fact that the volume of a fluid changes when its temperature changes. For ordinary temperatures the most important thermometers are those which employ mercury or some gas (generally air or nitrogen) as the expanding fluid. (For the measurement of high temperatures see PYROMETER.)

THE MERCURIAL THERMOMETER

The principle of the mercurial thermometer is that mercury when heated expands more than glass. If, therefore, a glass-tube having a bulb blown at one end be partially filled with mercury and immersed in a bath at a higher temperature than its own, the mercury will rise in the tube. If the bath have a lower temperature, the mercury will fall. If the mercury neither rise nor fall we may fairly conclude that the mercury and the bath are each at the same temperature. The essential features of a good thermometer are that it must be easily portable; permanent; always give the same reading when subjected to the same temperature; render it possible for the user to test the correctness of its graduation and determine any errors in its graduation; and be relatively small, so that when placed in contact with a second body the temperature of the second body will not be seriously affected.

In making a thermometer which will satisfy these conditions, the peculiar advantages of mercury are that it is easily prepared in a pure state; does not wet glass or stick to it; expands rapidly with changes of temperature, so that its changes in volume are easily read; that to each particular volume corresponds a definite temperature, which is not the case with water; and that it does not freeze except at temperatures comparatively low, and does not boil except at temperatures comparatively high.

The accompanying figure illustrates the four principal steps in the manufacture of an ordinary mercurial thermometer. First, a piece of thick-walled, capillary tubing of uniform bore is selected; a bulb is then blown on one end of this tube, after which the bulb is filled with mercury. It is then highly heated and "sealed off." The last step is the graduation of the tube of the thermometer.

Four stages in the manufacture of a mercurial thermometer.

Now it happens that there are two temperatures which are easily reproduced in the laboratory. These are the temperatures of melting ice and boiling water. On the centigrade scale the first of these is called 0° and the second 100°. The apparent change of volume between these two points is divided into 100 equal parts, each indicating *one degree*. On the Fahrenheit scale the interval between melting ice and boiling water is divided into 180°, the lower temperature being called 32° and the higher temperature 212°. For the *gas thermometer* the student is referred to Preston's *Theory of Heat*, Sec. II. See TEMPERATURE.

Thermopylæ (*thĕr-mŏp'ē-lē*), a famous pass leading from northern to central Greece, between Mt. Œta and an impassable marsh on the edge of the Maliac Gulf. The pass narrows at each end to the width of a single wheel-track, forming the eastern and western gates. Here King Leonidas (*q. v.*) of Sparta made his famous stand against the mighty army of Xerxes in 480 B. C. Learning that a Thessalian had betrayed to the Persians a path over the mountains to his rear, he sent away all his troops, which numbered some 7,000, except 300 Spartans, 700 Thespians and 400 Thebans. This chosen band made a sally and perished to a man. But one Spartan who was too sick to fight, escaped, only to meet the scorn of his countrymen on his return home.

Ther'mostat, Elec'trical, is an instrument for giving an alarm when the temperature rises to a point where the instrument completes the circuit, or when it falls to a point to produce a similar result. They are used in stoves, hothouses, dwellings and wherever uniform temperature is of vital importance. They are also used as maximum thermometers or fire-alarms. Various devices are employed, the simplest being the ordinary mercurial thermometer, the upper end of the tube not being hermetically sealed, but closed by an airtight cork of rubber, through which passes a metallic rod that can be raised or lowered in the tube. Whenever the expanding mercury reaches the tip of the rod, an electric current is closed and the alarm sounded. This alarm-current may be arranged so as to set off an electromagnet which will open or close a register or regulate the draft in the furnace. See THERMOGRAPH.

Thermotropism (*thĕr-mŏt'rō-pĭz'm*), the sensitiveness of a plant to heat coming from one side, in response to which the rate of growth is so unequally affected as to cause the part to bend toward or away from the source of heat; *e. g.*, corn-seedlings and hyacinth-leaves bend toward a warm iron-plate (30°C) placed near them; cress-seedlings turn away from it. See GROWTH and IRRITABILITY.

Theseus (*thē'sē-ŭs*), a famous Greek hero, said to have been the son of Ægeus, king of Athens. His most noted exploit was his offering himself as one of the youths yearly delivered to the Cretan minotaur, for the purpose of killing that monster. Ariadne, daughter of King Minos of Crete, fell in love with him and gave him a sword and a clue of thread, with which he killed the minotaur and escaped from the famous labyrinth. The fatal ship which carried the tribute youths always carried black sails. Theseus had promised his father to hoist white sails if successful in his undertaking. This was forgotten, and the king, thinking his son killed, threw himself into the sea. Theseus became king. He is said to have waged was

against the Amazons and the Centaurs, to have been one of the Argonauts, to have taken part in the Calydonian hunt, and to have carried off Helen from Sparta when she was only nine years old. For this he was attacked by Castor and Pollux, was driven from his throne by a revolt of the Athenians, and was killed by treachery.

Thes'saloni'ca. See SALONI'CA.

Thes'saly, the largest state of ancient Greece, reaching from Thermopylæ to the Cambunian mountains and from Mt. Pindus to the Ægean. But often the name was applied only to the Thessalian plain, which was surrounded by mountains and was the most fertile part of Greece. The plain was divided into two parts, Upper Thessaly the chief city of which was Pharsalus, and Lower Thessaly, having Larissa as its main city. The Thessalians were said to have emigrated from Epirus. There were three classes in the country: the rich land owners; Achæans and other conquered tribes; and serfs, who probably were the first dwellers in the land. In early times wars were carried on with the Phocians. About 400 B.C., under the tyrants Lycophron, Jason and Alexander, Pheræ became the foremost city and brought all Thessaly under its rule. Thessaly fell successively into the hands of the Macedonians, Romans and Turks. Part of it now belongs to Greece See Grote's *History of Greece* and Fyffe's *Primer of Greek History.*

The'tis. See ACHIL'LES.

Thian-Shan or **Celestial Mountains** are a chain in Central Asia, which extends from Pamir Plateau eastward as far as southern Mongolia. Some of the peaks attain the great height of 24,000 feet. There are a few extinct volcanoes in the range, and among the most typical rocks in its formation are granite, schist and limestone. On its western side the Thian-Shan chain subdivides into several ranges which are set in a fan-like formation.

Thiers (*tyâr*), **Louis Adolphe,** a French statesman, was born at Marseilles, April 16, 1797, the son of a locksmith. After attending the lyceum at Marseilles, he studied law at Aix. He then went to Paris to seek his fortune, and after a hard struggle with poverty became a newspaper writer and soon was widely known. But it was his popular *History of the French Revolution* which carried him from his garret in an out-of-the-way alley to fame, both as a writer and in politics. In 1830 he established a new democratic paper, *The National,* which greatly helped to bring about the revolution of 1830. Thiers at once became one of the ablest debaters in the chamber of deputies. He was minister of the interior in 1832, later was minister of commerce and agriculture, and in 1836 prime minister. A disagreement with the king in regard to the fortification of Paris led to his resignation and gave him the opportunity to begin his *History of the Consulate and of the Empire,* adding to his material by visiting England and personally inspecting the battlefields of Germany, Italy and Spain. He still was an acknowledged leader in politics, and protested against French union with England in her objections to the annexation of Texas, being unwilling, he said, to act against "the great American nation, the harbinger of French liberty." After the revolution of 1848 he became prominent in the assembly, supporting Louis Napoleon as president but warning the nation in vain of the danger of a new empire, thus causing his imprisonment and exile at its establishment. His return to the assembly was marked by his great speech against the enormous outlay in the Italian War and the expedition to Mexico and in improving the city. In 1870 he predicted defeat in the Franco-Prussian War, and, as chief of the executive, was successful in procuring a treaty of peace, in crushing the Commune (*q. v.*) and in carrying out a national loan for paying the German indemnity. He was given the title of president on Aug. 31, 1871, and succeeded in obtaining the withdrawal of German troops from French soil, but resigned in 1872. He was gathering material for a history of art and was writing his memoirs, when he died near Paris on Sept. 3, 1877.

LOUIS ADOLPHE THIERS

Thirty-nine Articles, The. The public standard of religious belief adopted by the Church of England. Their principles developed from 1534, when papal authority was thrown off by the English church, till 1582, when Convocation added its sanction. Next year they were published by royal authority. The articles are not intended to be a complete system of theology, but only to enumerate certain truths of such primary importance that denial of one is sufficient ground for exclusion from the church. They were framed for the establishment of consent regarding true religion, and treat of the doctrine of the trinity (Arts. 1-5); the sources of knowledge of religious matters (Arts. 6-8); sin and redemption (Arts. 9-18); and necessary relations of Christians as members of a religious community (Arts. 19-39). They were adopted by the General Convention of the American Episcopal Church in 1801, the Athanasian creed being excluded. In 1784, under Wesley's advice, the Methodist Episcopal church revised and adopted 25 of them.

Thirty Tyrants, The, were the body of aristocrats who governed Athens in the period after her defeat by Sparta in 404 B. C. The chief of these tyrants was Critias. They were chosen by the Spartans, who hoped to govern Athens by setting the aristocratic above the hitherto dominant democratic party; but in 403 they were overthrown by Thrasybulus and the Athenian exiles who returned with him. A secondary usage of the name occurs in Roman history, as applied to the military commanders who terrorized various parts of the Roman empire during the anarchical reigns (A. D. 253-68) of Valerian and Gallienus.

Thirty Years' War (1618-48), a terrible, continental struggle in Central Europe partly religious and partly political, which involved Germany and Austria, Bohemia, Denmark, Sweden and France. The war had its origin in 1618 in Bohemia, which, from being an elective monarchy and since the days of Huss and Jerome of Prague strongly Protestant, had come into the possession of the Roman Catholic house of Hapsburg, which ruled it despotically. In 1609 Rudolph, king of Bohemia and son of emperor Maximilian II, was forced, though under the influence of the court of Spain, to grant religious freedom to the Bohemian Protestants; but having in 1611 been intrigued against by his brother Matthias and displaced by him from the throne, the latter violated the concession made by Rudolph. The Bohemians retorted by throwing the imperial commissioners out of a window in the Hall of Regents, insisted on their rights as Protestants, and proceeded to fight for their religious privileges. The forces then arrayed against Protestantism were those of the House of Austria, which feared to lose its territories by the conflict impending, and those of the Catholic League, at whose head was the Duke of Bavaria, whose country was in the war that followed ravaged by the Swedes and French. In 1619 Emperor Matthias died, and was succeeded by Ferdinand II; him, however, the Bohemians would not accept, but chose a rival in the person of Frederick V. Elector of the Palatinate, son-in-law of James I of England. This action dispelled all hope of reconciliation between Bohemia and Austria, and the war, aided by the Duke of Savoy, was proceeded with under Thurn and Mansfeld; but, though Bohemia at first met with some successes, its forces were hard pressed by those under Count Tilly, who commanded the troops of the Catholic League and in November of 1620 met the elector's army at White Mountain, outside the walls of Prague, and there defeated and routed it the elector barely escaping capture. Frederick, though he found refuge at The Hague, was deposed and lost his dominions; but Mansfeld and the Protestant party in Bohemia continued the war; which was now (1625) joined by Christian IV of Denmark, who for the time became leader of the Protestant rising in northern Germany. He however, met with defeat at the hands of Count Tilly at Lutter in Brunswick (Aug. 27, 1626); Mansfeld also suffering defeat in the previous April by Wallenstein, the imperial general, at the bridge of Dessau in Anhalt. After this the whole of Silesia was dominated by the forces of the league, while Tilly and Wallenstein, joining their armies, pursued the Danes to the far north; and presently the whole of Schleswig and Jutland, save a few fortified towns, fell into their hands. Of these, the northern seaports of Stralsund and Glückstadt heroically held out against their besiegers; but Denmark, having had enough of the war, concluded with Ferdinand II the peace of Lübeck (May 22, 1629), Christian receiving back all his hereditary possessions and resigning all claim to the bishopric held by his family within the Holy Roman Empire. In the following year Wallenstein was dismissed by his master, owing to repugnance at the excesses of his soldiery, complained of at a meeting of the electors of the empire at Ratisbon.

At this juncture a new period of the Thirty Years' War is entered, by the intervention of Sweden and the appearance of Gustavus Adolphus (*q. v.*), the great Swedish king and soldier, of the royal house of Vasa. Gustavus had just concluded an armistice with Poland, through the mediation of Richelieu. Being loyal to the principles of the Reformation, he ardently intervened in the struggle between Roman Catholicism and Protestantism. Unfortunately his career was a short one, for he fell at Lützen (Nov. 16, 1632), though not before his Swedes were victorious over Wallenstein (who had been reinstated in command), and he had beaten Tilly at Breitenfeld with frightful loss to the Austrians. Despite the death of the Swedish king the war went on, Bernhard of Weimar, the companion of Gustavus, leading the Protestants, and Wallenstein commanding the imperial troops. With the religious objects of Ferdinand II and the Catholic League Wallenstein, however, had little sympathy; his object was rather that of selfish aggrandizement. Seeing that to be the case, a conspiracy was formed against him, which led to his assassination, inspired by Spanish gold. This occurred on Feb. 25, 1634.

Wallenstein's removal marks a turning point in the war for it now ceased to be a purely German and Protestant struggle. "In the course of years the German contest had come to involve all the rivalries and enmities which then agitated Europe: the quarrels of Sweden and Poland, the jealousy of Denmark against its northern neighbor, the struggle of Spain to reduce the Dutch into subjection and, above all, the enmity between France and Spain, which dated

back to the time of Charles V. It was these foreign interests that prolonged the war for the next 13 years."

At this juncture France comes upon the scene, taking the side of the Protestant powers of Germany at the very period when she was persecuting her own Protestant subjects. The reason, however, was not only her desire to crush the power of the house of Hapsburg, ascendant then both in Spain and in Austria, but, among other objects, to secure possession of Alsace and Lorraine for France and the empire. This was the motive and ambition of Richelieu, who coveted the Rhine provinces. Meanwhile, though the war had been maintained in the Protestant interest by Bernhard of Saxe-Weimar, the latter met with a sanguinary defeat (Aug. 27, 1634) at Nördlingen in Bavaria; and by the following spring the whole of southern Germany was in the hands of the imperialists. In spite of this check Bernhard and the Swedes continued the struggle, and four years later he defeated the imperialists at Rheinfelden, and captured Breisach. While these events were happening, Ferdinand II died and was succeeded by Ferdinand III who pursued the same ultramontane policy; and Bernhard himself also died. France and Sweden meanwhile prosecuted the terms of their alliance, the French invading the Spanish Netherlands; the Dutch destroyed a Spanish fleet; and Portugal, taking advantage of an insurrection in Spain, regained independence. The end now came in sight, for France on the Rhine had Condé and Turenne, the great generals, at the head of her armies, and Mazarin had succeeded Richelieu as French prime minister. Condé defeated the Spanish at Rocroi near the Belgian frontier; and at Allerheim he routed the imperialists (Aug. 3, 1645). Turenne, on the other hand, effecting a junction with the Swedish army, with it invaded Bavaria and overthrew Maximilian, who had been one of the chief organizers of the Catholic League. The war terminated with the peace of Westphalia (Oct. 24, 1648) and the occupation by the Protestant army of Prague, where the struggle had had its commencement. The gains of the war fell chiefly to France and Sweden; while Lutherans, Calvinists and Catholics alike were accorded religious freedom. But Germany did not recover for 200 years.

THISTLE

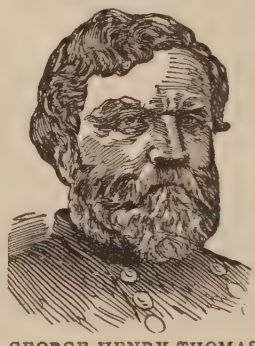
G. M. A.

Thistle (*this''l*), the name of species of certain genera of the composite family, popularly characterized by being stout and spiny. The genus to which the common thistles belong is *Cnicus*. Some of them are among our worst weeds, and their seed-like fruits (akenes) with plumy tufts of soft hairs are wafted everywhere on currents of air. The well-known Canadian thistle (*C. arvensis*) is wrongly named, as it is a noxious weed from Europe.

Thom'as a Kem'pis. See KEMPIS.

Thomas, Saint, one of the 12 disciples of Christ, is rarely mentioned in the New Testament. He is called doubting Thomas, as he refused to believe in the resurrection of Jesus until he had seen and touched Him. According to various accounts he preached either in Parthia, Egypt, Ethiopia or India.

Thomas, George Henry, an American general, was born in Southampton County, Va., July 31, 1816. He was graduated from West Point in 1840, W. T. Sherman being a member of the same class. He served in the Seminole and Mexican Wars, and later was appointed a professor at West Point. For six years he was in service in California and Texas. On the outbreak of the Civil War he remained loyal to the Union, and was made a brigadier-general. He served first in the valley of Virginia, but was soon sent to Kentucky and placed in command of a division. Here in Jan., 1862, he defeated the Confederate forces under Zollicoffer, and was promoted to major-general. In the hard-fought battle of Stone River, Tenn., he rendered distinguished service, showing his characteristic staying qualities. In the battle of Chickamauga, when the Union right was routed and Gen. Rosecrans gave up the field for lost, Thomas, who was in command of the left, held his position against the repeated onslaughts of the victorious Confederates, thus saving the army and earning the title of The Rock of Chickamauga. In the battle of Missionary Ridge Thomas with the army of the Cumber and held the Union center, which carried the enemy's intrenchments, scaled the heights and took the Confederate lines on the crest. Thomas rendered conspicuous service in the Atlanta campaign, which ended in the capture of that city. When Sherman started on his march to Savannah, Thomas was left to oppose the Confederate army under Hood, who moved west and north toward Nashville. While concentrating his forces at Nashville, Thomas



GEORGE HENRY THOMAS

sent Schofield to check Hood's advance, resulting in the hard-fought battle of Franklin. When Hood appeared before Nashville, Thomas delayed to attack him, taking time to organize and equip the detachments which had come to him from different points. Fault was found with him for his slowness to act; but when he finally attacked and routed Hood's army on Dec. 16, 1864, winning one of the most important victories of the war, his wisdom and sagacity were fully vindicated. He received the thanks of President Lincoln and of Congress, was promoted to be major-general in the regular army and received a gold medal from Tennessee. After the war General Thomas was in charge of several military districts. He declined the rank of lieutenant-general which was offered him, saying that he had done nothing since the war to merit promotion. He died at San Francisco, March 28, 1870.

No officer in the Civil War inspired in his men a greater measure of enthusiasm and personal affection than "Old Pap" Thomas, as he was affectionately called by his devoted army. As a commander he demonstrated qualities of the highest order, and will stand as one of the foremost figures in the history of the Civil War.

Thomas, Theodore, American orchestra-leader and conductor of the Chicago orchestra, was born at Esens, Hannover, Germany, Oct. 11, 1835, and came to the United States in 1845. He studied music assiduously and made his *début* as a solo violinist, afterward taking part in concerts and on tours in various parts of the country. In 1864 he inaugurated orchestral concerts, and three years later organized the Thomas orchestra. He subsequently became conductor of the Brooklyn and New York Philharmonic Societies, and on his removal in 1891 to Chicago he became conductor of an orchestra there and was musical director of the Columbian Exposition in 1893. He conducted notable musical festivals at Cincinnati in successive years, as also at New York and Chicago, and did much to further the interests of music in America and develop public taste for it. He died on Jan. 4, 1905.

Thom'asville, Ga., a city, the seat of Thomas County, on the Atlantic Coast and Atl. and Birm. railways, about 200 miles southwest of Savannah. It is an attractive winter-resort, with several large hotels, and is in an elevated, picturesque region, producing varied fruits, including figs, melons and grapes; while cotton, and tobacco are local staples. Its industries embrace cotton-compresses, carriage-works, planing-mills, creameries, a basket-factory and lumber-mills. It owns and operates its own water-works and electric-light plant, and has a city hospital and a public library, several educational institutions, including South Georgia College, Yoning Female College, and the Vashti Home for Girls. Population 6,727.

Thomp'son, Sir Benjamin, better known as Count Rumford, a brilliant engineer, statesman and soldier, born at Woburn, in Massachusetts, 1753; died at Auteuil, a suburb of Paris, in 1814. He appears to have been well-educated in spite of the fact that he largely was self-educated. Being an English sympathizer, he went to England at the outbreak of the American Revolution. Here he rapidly advanced in the state department. In 1779 he was elected fellow of the Royal Society. At the invitation of a Bavarian prince he went to Munich in 1783, where he remained for 11 years as minister of war and minister of police. During this period, while superintending the construction of cannon at the arsenal, he made a series of experiments which led him to think that heat is not an imponderable fluid, but a form of energy. He, therefore, is justly called one of the founders of the mechanical theory of heat. At Munich he was made Count Rumford. He and Sir Joseph Banks took part in the establishment of the Royal Institution in London. Rumford's second wife was the widow of Lavoisier, the distinguished chemist.

Thompson, Launt, an American sculptor, was born in Ireland in 1833, but was brought up in Albany, N. Y. He was nine years in Palmer's studio in Albany, where his bust of *Little Nell* made him well-known. A statue of General Winfield Scott, at the soldiers' home near Washington, a soldier's monument at Pittsfield, Mass., a colossal statue of Napoleon and a statue of the first president of Yale on the college grounds are some of his larger works. He died at Middletown, N. Y., Sept. 26, 1894.

Thompson, Richard Wigginton, an American politician and ex-secretary of the United States navy, was born in Culpeper County, Va., June 9, 1809, and died at Terre Haute, Ind., Feb. 9, 1900. When a young man, he was a clerk in Louisville, Ky., but afterwards moved to Lawrence County, Ind., where he studied law and was admitted to the bar. In 1834 he became member of the state legislature and later of the senate, acting for a time as president of the senate and lieutenant-governor. In 1841 he was elected to Congress, serving for several terms, and for a time was judge of the fifth Indiana circuit. In 1877 he entered Hayes' cabinet as secretary of the navy, and became chairman of the American Committee of the [French] Panama Canal Company. He wrote *History of the Tariff*, *The Papacy and the Civil Power*, *Footprints of the Jesuits* and *Personal Recollections of Sixteen Presidents*.

Thom'son, James, a British poet, was born in Roxburghshire, Scotland, Sept. 11, 1700. He studied six years at Edinburgh. His fame rests upon his poem, *The Seasons*. *Winter* appeared in 1726, followed by *Summer* (1727), *Spring* (1728) and *Autumn*. He wrote several dramas, *Agamemnon*, *Edward and Eleonora*, and *Tancred and Sigismunda*. The *Castle of Indolence*, next to *The Seasons* his best-known work, was written in 1748. The song *Rule! Britannia* is found in a masque, *Alfred*, written by Thomson in connection with Mallet. He died near Richmond, England, Aug. 27, 1748.

Thomson, Joseph John, a brilliant young English physicist, who has since 1884 occupied the most important chair of physics in Great Britain, that of *Experimental Physics* at Cambridge University. He was born near Manchester, Dec. 18, 1856; was educated at Owens College and at Trinity College, Cambridge, where he graduated as second wrangler and second Smith's prizeman in 1880. His work has been of profound character. Aside from numerous contributions to periodical literature, the following works give some idea of his activity: *Treatise on Vortex Motion; Application of Dynamics to Physics and Chemistry;* and *Recent Researches in Electricity and Magnetism*. In 1899 he achieved the division of the hydrogen atom. By a clear and logically connected series of experiments he split a small part from the hydrogen atom, which he calls a corpuscle. It has a mass of only one-thousandth of that of the hydrogen atom. For a popular account of this work consult *The Astrophysical Journal*, Vol. XI., pp. 170–4 (1900). See ATOM and HYDROGEN.

Thomson, Sir William. See KELVIN, LORD.

Thor (*thôr* or *tôr*), in Scandinavian myth, was the oldest son of Odin and Frigga and was the god of thunder. He ruled winds, seasons and agriculture. The *Eddas* speak of him as the champion of gods and men, hurling his thunderbolts at his enemies,—the monsters and giants. His weapon was an enormous hammer, which, after it was thrown, came back into his hand. He never grew weary. No matter how much strength he spent, it was renewed by a magic belt which he wore around his waist. Thursday is named from Thor.

Thoreau (*thō'rō*), **Henry David,** was born at Concord, Mass., July 12, 1817. He graduated at Harvard College in 1837, and became a surveyor. He lived the simplest of lives, spending most of his time in long tramps through the woods, in the study of nature and in writing. Emerson says of him: "He was bred to no profession; he never married; he lived alone; he never went to church; he never voted; he refused to pay a tax to the state; he ate no flesh; he drank no wine; he never knew the use of tobacco; and, though a naturalist, he used neither trap nor gun." This poet-naturalist built with his own hands a small cabin on the banks of Walden Pond near Concord, and lived there by himself for two years. His expenses during these years were nine cents a day, and he gave an account of his experiences in perhaps his finest book, *Walden*, published in 1854. Others were *Cape Cod*, *The Maine Woods* and *A Yankee in Canada*. No one else has lived so close to nature or so written of it. He died at Concord, May 6, 1862. See *Thoreau the Poet-Naturalist* by Channing and Sanborn's *Thoreau* in The American Men of Letters Series.

Thorn, a conspicuous rigid and sharp structure of plants. Thorns may be transformed leaves or branches, and are most extensively developed by plants of the arid regions.

Thorwaldsen (*tôr'wald-sĕn*), **Albert Bertel,** one of the greatest of modern sculptors, was born probably at Copenhagen, Nov. 15, 1770. When asked where he was born he said: "I don't know; but I arrived at Rome on March 8, 1797," thus dating his birth, as it were, from the beginning of his career as an artist. He was a son of a poor ship-carpenter, and first carved figureheads in the shipyard where his father worked. He had little schooling, and always was a poor writer and speller, but by 1793 he had gained a gold medal for a design and with it a chance to study abroad for three years. Only after long and hard study did he at last (1803) gain recognition by his *Jason*, but from this time he prospered. His return to Denmark in 1819 was triumphal and his reception almost royal. But a year later found him back at Rome, which he made his home. Thorwaldsen died on March 24, 1844, leaving to his country most of his great works and the bulk of his fortune, with which to build a museum where they should be kept. Of his many busts that of Byron is one of the finest. His famous *Christ and the Twelve Apostles* is in the cathedral of Copenhagen. See his *Life* by Plon.

Thrace (*thrās*), in ancient times the name of a country bounded by the Danube, the Euxine and Ægean Seas, Macedonia and Illyria. Roughly speaking, ancient Thrace, before the rise of the Macedonian power, embraced the territory now divided into Rumelia and Bulgaria. Under the Romans it included only the part south of the Hæmus or Balkan Mountains, while the northern part was called Mœsia. It was a mountainous country, the chief range being the Hæmus or, as it is now called, the Balkans, the highest peaks of which are over 8,000 feet above the sea. It was marshy and undrained, covered with deep

forests of fir, oak, chestnut etc., but parts of it, as the great plain of Adrianople, were very fertile; cattle, sheep, horses and swine were kept; and the chief products were wheat, millet, hemp and wine. Its gold and silver mines led to conquest by Philip of Macedon and by Lysimachus. Who the early Thracians were is not known. They were not Greeks, and they lived by robbery and war. The Greeks first heard of them through their coastal colonies, the chief of which was Byzantium. But the interior of Thrace kept its independence, except for a short time when conquered by the Persian general Megabazus, until conquest by Macedonia. In 168 B. C. it became Roman territory, was colonized by Sarmatians and Goths, overrun by Attila and Alaric, and conquered by Amurath the Turk in 1353.

Thrasher. See THRUSH (BROWN).

Thread, a twisted filament of flax, wool, cotton, silk or other fibrous substance, making a fine, strong and well-rounded as well as lengthy line for sewing with. For the operation of drawing out and twisting into thread see SPINNING.

Three Rivers, Can., county-seat of Maurice County, Quebec, is on St. Lawrence River at the head of tide-water and where the St. Maurice divides before entering the greater stream. It extensively manufactures the bog-iron found near by and does a large trade in lumber. It was founded in 1634. The population is 9,981.

Thresh'ing Machine', a machine or apparatus for beating out the seed of grain and separating it from the straw. In recent and more perfect machines, besides the grain-conveyer which carries the grain, chaff and short straws by an oscillating motion to the sieves in the shoe, where it is cleaned by the fanblast, there usually are attached operating grain-weighers, measurers, tailings, elevators and baggers, in addition to self-feeders, automatic band-cutters and other mechanically operated and labor-saving devices. The perfection reached to-day by the modern type of American thresher is indicated by the fact that, where driven by an engine of 15 or 20 horse-power, as many as 4,000 bushels a day are threshed, with the best and most satisfactory results in separating the grain from the straw.

Throwing the Hammer. See PUTTING THE SHOT.

Thrush, the common name for any bird belonging to the genus *Turdus*. Thrushes occupy the highest rank in the class of birds. They belong to a large family which embraces about 300 species found in most parts of the world. They usually are fine singers. The eastern hemisphere has a larger number of varieties than the western one. Our familiar robin is a thrush. Of the various thrushes common in the eastern United States all, save the robin, have plain, brown backs and spotted breasts. The wood-thrush is the best known. It is a bird about two inches shorter than the robin, cinnamon brown above with a

WOOD-THRUSH

whitish breast spotted with very distinct dusky spots. As its name indicates, it is a bird fond of woods, but will perch and sing in maples and elms on quiet village-streets. Its voice is flute-like and its song lively and engaging. It nests in woodland and in shrubbery about a house; builds a nest closely resembling that of the robin but somewhat deeper, the materials being leaves, roots, weed-stems, mud, bits of cloth and paper. There are three or four (rarely five), greenish-blue eggs. It is also known as the song-thrush, and corresponds to the song-thrush of Europe, which is a little larger but otherwise like our wood-thrush. The hermit-thrush is a northern bird smaller than the wood-thrush. It seldom nests south of Vermont or northern Michigan, and extends northward to the Arctic regions. It is not often seen, but the song of this shy bird is of rarest beauty. Wilson's thrush or the veery ranges between the two in nesting habits, not extending so far north as the hermit nor so far south as the wood-thrush. It seldom nests south of 40° N. It is one of the smaller thrushes, and utters a song of much sweetness, its voice sometimes being heard at night. The brown thrasher, also called brown thrush and ground-thrush, is the "merry, brown thrush sitting up in a tree." This bird is longer than the robin, of slender build, red-brown above, underneath white spotted with dark brown; its tail is very long. In the manner of using the tail to

give expression to its feelings it shows itself a true cousin to the wrens, but variously shows relationship to the true thrushes. This bird is widely distributed, a familiar summer resident, its joyous song familiar and well-prized. The nest is built in the ground or in a low bush. It is a bulky structure of twigs, rootlets and leaves lined with horse-hair and feathers. The brown thrasher is accused of being a fruit-thief, but in return for tribute levied he destroys many baneful insects. The jolly lay is poured forth from topmost branch of thickset haunt.

Thucydides (*thū-sĭd'ĭ-dēz*), the great historian of the Peloponnesian War, was an Athenian, born probably in 471 B. C. He owned gold-mines in Thrace, and was one of the few who recovered from the terrible plague at Athens. He was in command of an Athenian squadron in 424, when summoned to Amphipolis to save it from falling into the hands of the Spartans, but arrived on the evening of the day on which the place surrendered. For this failure Thucydides was exiled. According to his own account this exile lasted 20 years. It seems certain that he died a violent death, but when or how is not known. Hardly any literary work has received higher praise than the great work of Thucydides. It is remarkable for its truthfulness and for the short, simple and realistic way in which he has recorded facts that must have taken months to gather, sift and decide upon. Macaulay repeatedly said that no historian need ever hope to equal Thucydides. See Fyffe's *Primer of Greek History*.

THUCYDIDES

Thug, meaning a cheat, is the name of a religious brotherhood in India, which in honor of the goddess Kali commits murders and lives chiefly from the plunder got from its victims. Thugs usually band in gangs of ten to fifty or more, and travel, if wealthy enough, on horseback with tents, under the guise of traders. Each gang has its leader; its teacher; its entrappers; its stranglers; and its grave-diggers. They inveigle travelers to join them on the plea of safety, or lie in wait for them. When the victim is strangled and robbed, his body is buried in an out-of-the-way place, and is sometimes mutilated. Thugs also infest the rivers. They are superstitious, and never commit murder unless all omens are favorable. It was not till 1831 that energetic measures were taken to stop these practices, but thuggee, as it is called, has not yet wholly disappeared.

Thur'man, Allen Granbery, an American statesman, was born at Lynchburg, Va., Nov. 13, 1813. When six years old, his family moved to Ohio. He became a lawyer and was chosen a representative in the 29th Congress. In 1851 he was made judge of the supreme court of Ohio, serving as chief-justice from 1854 to 1856. He ran for governor of Ohio in 1867. During his two terms as United States senator (1869–81) he was one of the ablest and most prominent members of that body. In 1888 Thurman ran for vice-president on the Democratic ticket with Cleveland. He died on Dec. 12, 1895.

Thyrsus (*thĕr'sŭs*), a compound raceme or panicle in which a compact, pyramidal cluster of flowers is formed, as in the lilac or a bunch of grapes. See INFLORESCENCE.

Ti'ber, a famous Italian river, rises in the Apennines, passes through Rome, and falls into the Mediterranean by two mouths near Ostia, after a course of 230 miles. Between Lodi and Passo del Forello are rapids, and here the river runs through a narrow gorge for several miles. The Tiber is navigable for ships to Rome, 18 miles from its mouth, where it is 500 feet wide, and for boats of light draught to the mouth of the Neva, 72 miles further up. The Tiber has always been noted for its yellow color, which comes from the yellow clay through which it passes Besides Rome, the chief city on its banks is Perugia. Steps have been taken to deepen and otherwise improve the Tiber's course.

Tiberius (*tī-bē'rĭ-ŭs*), emperor of Rome, was born on Nov. 16, 42 B. C. As the stepson of Augustus he was adopted by that emperor, and saw service at the head of the legions on the outposts of the empire. He was popular with Augustus, the soldiers and the people, and was married to Julia, the emperor's daughter. He ascended the throne in 14 A. D., and, according to Mommsen, was the best of the emperors. Tacitus grossly misrepresented his character and life. When power fell into the hands of Ælius Sejanus, a Roman knight and a commander of the Prætorian guards, a man of ability, Sejanus ruled well, though he murdered leading citizens, pouring tales of conspiracy into the ears of Tiberius. But Sejanus could not hide his ambition to become emperor in name as well as fact, and fell in 31 A. D. There has been an almost complete reversal of the unjust verdict of history on Tiberius. It is recognized that he ruled the people well, though the Roman court suffered injustice at his hands in retaliation for the disloyalty of the old aristocracy. Consult Mommsen's *Roman Provinces;* Beesley's *Catiline, Clodius and Tiberius;* Duruy's *History of Rome;* and Tarver's *Tiberius.* It was in the reign of Tiberius that Christ was crucified at Jerusalem. The emperor died on March 16, 37 A. D.

Tibet or **Thibet** (*tĭb'ĕt*) is the south-eastern portion of the vast central plain of

Asia, between 28° and 36° N. and 79° and 103° E. It lies between Chinese or East Turkestan on the north; China proper to the east; Bhutan, British Hindostan and Nepal on the south; and Kashmir in the west. Thus it extends eastward from the Pamirs (*q. v.*) between the Himalayas and the Kwen-Lun Mountains to China. Strangers having been jealously excluded, wide regions remain unexplored.

Area and Surface. Estimates of the area vary from 463,200 to 812,000 square miles, the true area probably being over 700,000 square miles, while the population is variously reckoned as 2,250,000 or 6,500,000, though it more likely is about 4,500,000. The extreme length is 1,600 miles east and west, the breadth from 150 miles in the west to 700 in the east. The country is the largest and loftiest tableland on the globe. The Himalayas shut it in on the south, the Kwen-Luns on the north. The Karakoram and its spurs traverse the west, separating Tibet from Kashmir, while the Yun-Ling Mountains on the east part China and Tibet. The plateau is not level, but is dotted with peaks and ranges, 20 heights being higher than the loftiest Andes and the general height of the plains 10,000 to 17,600 feet above the sea, while the mountains rise almost equally above these plains. The Kwen-Lun sends numerous outrunners south into the plateau; eastern Tibet is traversed by somewhat parallel ranges; and in the south Hedin (*q. v.*) has discovered a range 2,000 miles long, hitherto unknown, running about west and east.

Drainage and Climate. Tibet is a mother of mighty rivers. The Brahmaputra (*q. v.*), Hoang-Ho, Indus, Irawadi, Salwin, Sampu, Sutlej and Yang-Tze-Kiang all rise in Tibet. The Karakoram Mountains enclose a valley drained by the headwaters of the Sanpu and Indus (*q. v.*), the basin of the former being Tibet proper, that of the Indus forming Ladak and Bultistan. North of the Karakoram is the large desert called Katchi in the east and Khor in the west. The Yang-Tze (*q. v.*) in the east drains the tract named Khan. The Hoang-Ho (*q. v.*) rises in the hill-country of Lake Kokonor in northeastern Tibet. Large lakes are numerous throughout the country. In the north and west the enclosed plains form poorly watered, inland drainage-basins and contain saline lakes. Tibet's extreme elevation, though it lies approximately between the latitude of Constantinople and that of New Orleans, gives it almost arctic winters. The mountains and plains rob the air of moisture on its inland journey from the oceans, whose nearest point, the Bay of Bengal, is hundreds of miles away. So the climate is excessively dry, the fluctuations of temperature great and sudden, and the northern winds in winter biting to the bone. Timber never rots, meat never spoils, wood becoming brittle and flesh drying until it can be powdered. Among the mountains huge glaciers abound, one, 32 miles long, being four times the size of Switzerland's world-famous *Mer de Glace.*

Resources. The plains, like the *steppes* of Russia and Central Asia, are used for grazing, but vegetation is scant and is that of deserts and of alpine regions. Green meadows occur only along streams, but forests of birch, coniferous trees and poplar exist on the mountains of eastern Tibet. Wild beasts abound in watered districts, and antelopes, wild asses and yaks or Tibetan oxen are numerous on the *steppes.* The fertile valleys produce fruits and grains, barley and other cereals, as, also, pulse and vegetables being grown, and some favored regions even yielding peaches and grapes. The domestic animals are the sheep and yak, but in some regions there are buffalo, camels and swine. Irrigation is necessary, and terraces are built along slopes to retain water. Borax, copper, niter, salt, silver, sulphur and tin abound; there are considerable quantities of gold, borax, gold and salt being the minerals most worked; but lack of fuel makes the development of mineral wealth slow.

Inhabitants and Industries. The people belong to a semicivilized Mongolian race akin to the Burmans. They are industrious, intelligent, and skilful. Their language is not unlike Chinese, but is written in characters that express many syllables. The northern Tibetans are nomadic, but the southern ones live in houses, building them of stone or sun-dried brick. Polyandry, the marriage of one woman to many men, prevails among the lower classes. Courts of justice exist, but the ordeal or the lot often decides doubtful cases, and even torture is used in criminal cases to obtain evidence. Local conditions decide what occupations can be pursued, and in some places agriculture is carried on, whereas in other places only pastoral pursuits can be followed. Though the industries are not important, wool-spinning, weaving and knitting are common and many hands have skill in making images and decorations for temples. The people are ingenious jewelers, and make fine fabrics of goat's hair and wool. A large literature, mainly religious, has accumulated, and printing has been practised for centuries. There is a large trade with Turkestan and China; considerable traffic crosses the Indian frontier; and furs, gold, musk, precious stones and wool are exported.

Government and Religion. Tibet is a theocracy, the church being the state and the priests the real rulers, though China is the suzerain of Tibet. Chinese authority is represented by two officers, who, respec-

tively, have charge of foreign relations and of military matters; by three commanders of the permanent Chinese garrison (about 4,600 men) at Dingei, Lhasa and Shigatse; and by a few other officials. But the administration is almost wholly in Tibetan hands. The religion is that form of Buddhism (*q. v.*) which is called Lamaism, but beside it exist the superstitions of shamanism. The priests, called *lamas*, are exceedingly numerous. At their head is a high-priest, the *Dalai Lama*, who lives in a palace near Lhasa, rules through a priest appointed for life by the Chinese government as a minister, and claims to be the head of the Buddhist world. The priests have superbly decorated temples, and their monasteries, containing thousands of inmates, resemble populous towns. The organization and ceremonies of Lamaism are so like those of the Roman church that Huc and Gabet, French missioners to Tibet in 1844–6, thought Satan had made it in mockery of the Christian church.

History. Tibet, with Korea and Abyssinia, has been a hermit among nations. About Christ's time Sakya, the Hindu Buddhists' last great teacher, settled at Lhasa (*q. v.*), where it is thought that he lives yet in the Dalai Lama. But the historical and formal entry of Buddhism really occurred in A. D. 622,—the very year Mohammed left Mecca. In 821 Tibet paid tribute to China. Western Tibet was overrun by Turks, till Aurungzeb in the 17th century expelled them. Odorico, an Italian friar, visited Tibet in 1328; Andrada, a Portuguese Jesuit in 1534; and Capuchin missionaries in 1708-44. Tibet became a dependency of China in 1720. The priests enforced strict exclusion of all foreigners who were not Buddhists. Russia gained influence in Tibet about 1890. In 1890 and 1893 England made Tibetan treaties with China to remove hindrances from Indian trade with Tibet. The Tibetans failing to observe the terms of the treaty, Britain in 1903–4 sent a military expedition to Lhasa. Its commander concluded a treaty with the Tibetans themselves which removed all causes of friction, the latter paying an indemnity and the English evacuating Chumbi Valley in 1908. No Tibetan territory may be sold, mortgaged or leased to any foreign power without English consent, nor Tibetan public works or affairs be subject to foreign interference or management. China assented to this in 1906, and Russia and Britain agreed in 1907 to negotiate with Tibet only through China and to send no representative to Lhasa. Consult Huc's *Recollections of a Journey to Tibet;* Landon's *Opening of Tibet;* and Landor's *Tibet and Nepal.*

Tick, a kind of mite having the mouth in the form of a sharp beak. Birds and mammals suffer especially from it. They are very common in warm countries and are parasites on cattle. The so-called sheep-ticks are insects with six legs, while all true ticks have eight legs, like the spiders. They live on plants and will attach themselves to the skin of man as well as to animals. The wood-tick is common in our woods in certain sections. Squirrels, rabbits, pigeons and chickens, — each is affected by a special tick. Eight species are found upon cattle in this country, and diseases of cattle are transmitted by the cattle-ticks. Those of South Africa and Brazil are dreadful pests. In South America they cling in clusters of hundreds to slender twigs, and transfer themselves to horses and cattle. They bury their heads under the skin and suck blood, becoming as large as a horse-bean. Herds of cattle are sometimes killed by the exhaustion produced by these parasites. Wet weather is fatal to them, and infested animals are often freed from them by swimming a river.

Tick'nor, George, an American author, was born at Boston, Aug. 1, 1791. He graduated at Dartmouth College when 16, and studied law. In 1820 Ticknor became professor of French and Spanish in Harvard College. His *History of Spanish Literature* was published in 1849, at once took high rank, and was translated into Spanish, German and French. His *Life of Prescott* is considered one of the finest biographies ever written. Ticknor died on Jan. 26, 1871. See *Life* by Hilliard.

Ticonderoga (*tī-kŏn-dĕr-ō'gȧ*), a village of New York at the outlet of Lake George, 88 miles northeast of Albany. Population 2,475. The French in 1755 built Fort Carillon here, afterward called Fort Ticonderoga, to command Lake Champlain. Two years later Montcalm led his force of 9,000 men from this fort and captured Fort William Henry, which had been built by Sir William Johnson at the southern end of Lake George. In 1758 General Abercrombie was defeated by its garrison with a loss of 2,000 men; but next year General Amherst forced the French to dismantle and abandon it. After the battle of Lexington Ethan Allen (*q. v.*) stormed Ticonderoga on May 10, 1775. Next year Burgoyne, by planting a battery on Mount Defiance, forced the American garrison to leave Fort Ticonderoga, which the British held until Burgoyne's surrender, though it was attacked by General Lincoln. The British also held it a short time in 1780. Parts of the walls are still standing. See Joseph Cook's *History of Ticonderoga.*

Tides, the periodic rising and falling of the waters of the sea along coasts and inlets. The rising is called the *flood,* and when highest is called *high water;* the falling is called the *ebb,* and at its lowest is known as *low water.* The short lull between tides is called *slack water.* Flood-

tide and ebb-tide each last approximately six hours, there being two high and two low tides daily. Each day high water occurs 52 minutes later than the day before, as the average time between two high or low tides is 12 hours and 26 minutes Sir Isaac Newton first discovered the cause of the tides by applying his newly discovered law of gravitation, showing that the rising of the waters is due to the difference between the attraction of the moon and of the sun upon the earth as it revolves. As the particles of water are free to move while the particles of land are not, this attraction draws them toward the moon, forming a swell in the ocean's waters. This swell draws toward it waters from both sides, leaving on the coasts a depression, or low water. Gravitation acts on the solid mass of the earth as if this mass were concentrated at the center of the globe. So on the side of the earth opposite that of the moon the waters are less attracted than the land, being at a greater distance, and are as it were, left somewhat behind, thus forming another swell, just opposite to the one in the other hemisphere. By the rotation of the earth this system of swells and troughs travels from east to west over every part of the ocean. The attraction of the sun also causes two daily tides, but these solar tides are much smaller than the lunar tides. As the moon and sun rarely are in the same relative positions, their high tides do not usually occur at the same time. But at new moon and full moon they are in line with the earth and their attractions act together, causing especially high water, known as the *spring tides*. At the time of the first and of the third quarter of the moon, it is at right angles with the sun, and their attractions act against one another, lessening the height of the high water. These are the *neap tides*.

A complete explanation of the tides cannot be given in this place. For this the student is advised to read Sir Robert Ball's *Time and Tide* in the Romance of Science Series; articles 464–84 in Young's *General Astronomy;* Francis Darwin's *Tides*, popular lectures before Lowell Institute; and, lastly, his masterly article on *Tides* in the *Encyclopædia Britannica*.

In the references just given the tides are treated as a wave-motion, which they really are. This is the only point of view from which they can be satisfactorily considered. See WAVE-MOTION.

Tien-Tsin (*tē-ĕn'tsēn*), a large city of China, is on Pei-ho River, 38 miles from its mouth and 80 southeast of Pekin. The old mud and dried-brick houses have been replaced in part by well-built dwellings. The Pei-ho is generally frozen from the middle of December to the middle of March, and business, at other times carried on by means of boats and junks, is then done by sledges which swarm on the river. Tien-Tsin is an open port; it exports large quantities of cotton, peas and dates and imports cotton-goods, needles, window-glass, sugar and paper. Population 800,000.

Tierra del Fuego (*tĕĕr'ra dĕl fwā'gō*), "Land of Fire," is a cluster of islands at the southern end of South America, with the Straits of Magellan between them and the mainland. They are small, mountainous islands, with many peaks over 5,000 feet high, covered with perpetual snow, while the lower slopes bear forests of beech. The island proper is Tierra del Fuego, 300 miles long. Cape Horn is the southern end of a small island of the group. The natives belong to the Patagonian race; build cone-shaped huts of branches of trees stuck in the ground with a hole for a door; dress in sealskins; and feed largely on shellfish. The climate is very variable, with storms, wind, rain and snow in close succession. The islands were discovered by Magalhaes (Magellan) in 1520, and named from the fires seen at night along the shores. They are nominally divided between the Argentine Republic (*q. v.*) and Chile (*q. v.*). See PATAGONIA.

Tif'fin, O., county-seat of Seneca County, is 34 miles by rail southwest of Sandusky, on Sandusky River. It is the seat of Heidelberg University, founded in 1850. There also are two daily and four weekly newspapers, a courthouse, three banks, sixteen churches, a convent, several schools and two libraries. It manufactures carriages, stoves, furniture, tiles, farming implements, and has potteries, glass-works, straw-board, emery-wheel and iron works, planing, flour and woolen mills and shoe-factories. Tiffin has the service of four railroads, and near the city are deposits of clay and glass sand. Population 11,894.

Tiflis (*tyĕ-flyĕs'*), an important city of Asiatic Russia on Kur River, 165 miles east of the Black Sea. It is the capital of the Russian government of the same name in Transcaucasia, and is on the military railroad which joins the Black and Caspian Seas. It has a large trade with Persia, and manufactures woolen and linen cloth, carpets and arms. It is noted for its warm-spring baths. Population 159,590.

Ti'ger, the largest and most powerful member of the cat family. The lion appears larger on account of its immense hairy head and mane, but the royal Bengal tigers reach a length of 11 feet and are able to overcome the lion in combat. They have a tawny ground-color, with black stripes on the body and limbs, the tail being ringed with black, the coloring closely resembling that of the herbage. The common tiger is about eight feet in length. It is abundant in Hindustan, does great damage to herds of cattle, and occasionally attacks man,

The tiger's jaws and teeth crush the large bones of a buffalo, and it can break a horse's back with one blow of the forepaw. It is audacious, cunning, treacherous, the fiercest and most bloodthirsty of beasts. The kittens are about a foot long when born; they remain with the mother until the third year. The tigress teaches the young how to find and kill prey. They stalk their prey, and also spring upon it

TIGER

from ambush. A cattle-eating tiger will kill an ox about every five days or from sixty to seventy in a year. Hunting the tiger from the backs of elephants is dangerous and exciting. The range of the tiger is greater than was at first supposed. Starting with India as its chief locality, it ranges west through Persia, east through Burma to Sumatra and Java and north through China to Manchuria and even into Siberia. It is absent from Ceylon and Borneo.

Tig'lath Pile'ser. See ASSYRIA.

Ti'gris, a large river of Asiatic Turkey, rises south of Lake Goljik in the Kurdish Mountains, is joined at Til by the Bitlis, unites with its sister-stream, the Euphrates (*q. v.*), at Korna, and from this point to the Persian Gulf is known as the Shat-el-Arab. Its whole course is some 1,500 miles long. In its upper part it is a very swift stream. The Tigris in ancient times was the great river of Assyria, and formed the eastern border of Mesopotamia. Nineveh, Seleucia and Ctesiphon stood on its banks. Its chief cities now are Baghdad, Mosul and Diarbekir. It is navigable for steamers at all seasons below Mosul.

Til'den, Samuel Jones, was born at New Lebanon, N. Y., Feb. 9, 1814. He went to Yale College and the University of New York, and became a lawyer. As a member of New York Assembly in 1846 he was much interested in the state canals, and became one of the leading Democrats of the state. In 1874 Tilden was elected governor by 50,000 majority, and his popularity, thus shown, gave him the Democratic nomination for the presidency in 1876. The Hayes-Tilden campaign was one of the hardest-fought and closest in our history, and the disputed election was given Hayes by the electoral commission of 15 appointed by congress to canvass the votes. Tilden also was a prominent lawyer of New York City. He was one of the organizers of the bar-association, and was leading counsel in many large cases. He died near Yonkers, N. Y., Aug. 4, 1886, leaving the bulk of his fortune to found a free library for New York City. See NEW YORK LIBRARY.

Tiles. A tile is a slab of baked clay, used for covering roofs, paving floors, lining furnaces, constructing drains and for decorative purposes. The general process of manufacture involves preparing, mixing, molding and firing the clay, after which it may be polished. Fire-proof and structural tile is coming into extensive use; there are three classes: dense, porous and semiporous. The latter two are made by mixing the clay with straw, sawdust or fine coal. The porous tile can be nailed to and cut with a saw. The decorative value of tiling is seen chiefly in flooring. The body of the tile is made of one color of clay and the inlaid pattern of another. Many times figures are put on in slight relief. Tiles made in Cairo and Damascus in medieval times are of such beauty that squares of nine or sixteen are often sold for many hundreds of dollars.

Til'ley, Sir Samuel Leonard, was born in New Brunswick in 1818. He was a member of the Executive Council of New Brunswick from 1854 to 1856 and from 1857 to 1865, from 1866 until the Union holding the office of Provincial Secretary. He was frequently a delegate to England; a delegate to the Charlottetown and Quebec Conferences in 1864 and to the London Colonial Conference in 1866. He was Minister of Finance on two occasions, and was Lieutenant-Governor of New Brunswick from 1873 to 1878. He was returned to the House of Commons in 1878 and re-elected the following term. When a private member he carried the prohibitory liquor-law through the New Brunswick Assembly. He is one of the fathers of Canadian federation.

Till'man, Benjamin Ryan, was born in Edgefield County, South Carolina, on Aug. 11, 1847. He was educated at Bethany Academy, but his studies were interrupted by the Civil War. He joined the Confederate army in July of 1864, but a severe sickness cost him an eye and invalided him for two years. During the time of reconstruction (*q. v.*) he was active in promoting education and became politically prominent, but followed farming as his sole pursuit until 1886. Then he was a leader of the agitation for educational, industrial and other reforms and in the opposition of the Democratic

masses in South Carolina to the domination of the aristocratic elements in the party. Mr. Tillman advocated the formation of a Farmer's Alliance, of Clemson Agricultural College (at Calhoun's old home) for boys and of Winthrop Industrial College for girls, each of which is the largest school of the kind in the south. In 1890 and in 1892 the Farmer's Alliance elected him governor. He instituted the dispensary system of selling liquor under state control; and was the central figure in the constitutional convention (1895), which enacted South Carolina's educational qualification for suffrage. In 1895 and 1901 he was elected to the United States senate.

Tillman, Samuel Escue, American soldier and educator, astronomer and chemist, was born near Shelbyville, Tenn., Oct. 2, 1847, and graduated at West Point, entering the army first as an artilleryman and afterward was transferred to the corps of engineers. In 1870 he was appointed assistant-professor of chemistry, and ten years later became professor of chemistry, geology and mineralogy at West Point; was assistant-astronomer of the United States expedition to Tasmania to record the transit of Venus; and has acted on several survey commissions and explorations for the United States government. He is the author of a number of textbooks in his branch of science, notably a work on *Descriptive General Chemistry*, and elementary treatises on mineralogy, on the principles of chemistry and lessons in heat.

Til'ly, Johann Tserclaes, Count of, one of the greatest captains of the 17th century, was born in 1559 in Brabant. A pupil of the Jesuits and an officer under the duke of Alva, he developed into a soldier of great sternness. After fighting against the Turks, he was made commander of the Holy Roman Empire's army on the outbreak of the Thirty Years' War (*q. v.*), and with Maximilian of Bavaria gained the important battle of Prague. During the course of this war his masterly tactics separated the armies of Mansfeld and the Markgraf of Baden, beat the latter at Wimpfen, and drove Christian of Brunswick from the Palatinate, defeating him at Höcht in 1622 and again next year, in a desperate three days' battle at Stadtlohn. Now made a count of the empire, he defeated the king of Denmark at Lutter and, with Wallenstein, forced him to sign the treaty of Lübeck in 1629. Two years later he succeeded Wallenstein as commander-in-chief of the imperial troops, took Magdeburg by storm, and allowed his Croats and Walloons to pillage and massacre at pleasure. A few months later he met his match in Gustavus Adolphus, who defeated him at Breitenfeld and next spring forced him to retreat behind Lech River in Bavaria, crossing it himself in the face of Tilly's army. In this last battle Tilly was mortally wounded and died on April 30, 1632. Tilly was temperate, despised luxury and wealth, and his able support of the Roman Catholic party in the war was not due in the slightest to self-interest, but wholly to his devotion to the church.

Til'sit, The Treaty of, was a celebrated pact made by Napoleon I of France, and Alexander I of Russia in 1807. The emperors met on a raft at the center of Niemen River on June 25th; and a treaty of peace was concluded on July 7th. France and Russia made a secret agreement by which Russia was to aggrandise herself at the expense of Sweden and Turkey; and France in the west of Europe. A passive partner to the treaty was the subjugated kingdom of Prussia, which was forced to close her ports to English vessels, pay an indemnity, reduce her army to a nominal footing, and leave her fortresses as security in the hands of the French. The dominions of Friedrich Wilhelm III of Prussia were reduced one half.

Timbuktu (*tĭm-bŭk'tōō*), a city on the southern edge of the Sahara, in central Africa, some nine miles from the Niger. It is about three miles around, and formerly was surrounded by a clay-wall. Timbuktu has a large caravan-trade, gold-dust being the most important export. The people are negroes, Tuaregs, Mandingoes, Arabs and Fulahs. The city was founded in the 12th century, but was first seen by a white man in 1826. Timbuktu now belongs to France, and a railroad is proposed to connect Algiers, Timbuktu and Senegambia. It already is connected by steamer with Koulikoro. Population 12,000, greatly increased during the trading-season from November to January. See NIGERIA and SENEGAL.

Tim'by, The'odore Rug'gles, inventor of the *Monitor* (*q. v.*) was born in Dover, New York, 1822, and from childhood was an inventor. He was the first to suggest the modern use of iron in warships. In 1841 he exhibited, and in 1843 patented, a model and plans of a revolving battery to be made of iron. In 1861 he entered into an agreement with the builders of the *Monitor*, of which Ericsson (*q. v.*) was the constructing engineer, for the use of his invention. It has been mistakenly credited to Ericsson, but Timby's claim was never officially disputed. It is he who revolutionized the building of modern warships.

Time, like space, is one of the conditions under which all things are perceived. Time may be defined as *duration*, but it is doubtful whether anything is thereby added to the idea which every one already has as to the nature of time. Our notion of time as a quantity is derived from the observance of some regularly recurring event, such, for instance, as the vibration of a pendulum. In such a case we say that the "amount of time" elapsing between two events is pro-

portional to the number of vibrations which the pendulum has made between the two events. The unit of time employed by the whole world is the *average* time which elapses between two successive transits of the sun across the meridian. This unit is called the *mean solar day*, and is divided into 86,400 parts called *seconds*, which are the units most frequently employed in measuring small intervals of time. The sun does not move through the sky at a uniform rate; but we can imagine one which does, and makes the same number of revolutions per year as the actual sun. Such a sun is called the *mean sun*. The instant at which the mean sun crosses any meridian is called *noon* for that meridian or *local noon*. Time which is measured from a local meridian is called *local time*.

Since 1883 the United States have employed time which is counted from Greenwich noon, and is called *standard* time. Thus the inhabitants of Labrador and Nova Scotia employ time which differs from that at Greenwich by *exactly four hours;* this is called colonial time. In the extreme east of the United States, neighboring on each side of the 75th meridian, all correct watches and clocks differ exactly five hours from Greenwich time; this is called *eastern time*. In the Mississippi valley the time is six hours later than Greenwich, and is called *central time*. Fifteen degrees west we have *mountain time;* and along the Pacific coast the time is eight hours later than Greenwich and is known as *Pacific time*. *Middle European time* is one hour faster, and *Eastern European time* is two hours earlier, than Greenwich. Recently the Australian states have adopted Greenwich time — or, what amounts to the same thing, they use time which differs exactly eight, nine, ten and eleven hours from Greenwich.

Tim'othy, a disciple and companion of St. Paul. He was the son of a Greek and a Jewess, and his home either was at Derbe or at Lystra, in Lycaonia. Paul set him apart as a minister of the gospel. After preaching in Macedonia and Achaia he went at Paul's request to Ephesus, and accompanied the apostle to Jerusalem. It was to him that the two *Epistles to Timothy* were addressed by Paul. According to tradition, Timothy suffered martyrdom under Domitian.

Timur (*tē-mōōr'*) or **Tamerlane** was the second of the great conquerors whom central Asia sent forth in the middle ages, and was born at Kesh, about 40 miles southeast of Samarkand, April 9, 1333. His father was a Turkish chieftain and his mother claimed descent from the great Genghis Khan. When he became tribal chieftain, Timur helped Emir Hussein to drive out the Kalmucks. Turkestan was divided between them, but war broke out between the chiefs, and the death of Hussein in battle made Timur master of all Turkestan. He now began his career of conquest, overcoming the Getes, Khiva and Khorassan, after storming Herat. His ever-widening circle of possessions soon embraced Persia, Mesopotamia, Georgia and the Mongol state of Kiptchak. He threatened Moscow, burned Azov, captured Delhi, overran Syria, and stormed Baghdad, which had revolted. At last, July 20, 1402, Timur met Sultan Bajazet on the plains of Angora, captured him and routed his army, thus becoming master of the Turkish Empire. He took but a short rest at his capital, Samarkand, and in his eagerness to conquer China led 200,000 men across the Jaxartes on the ice, and pushed rapidly on for 300 miles, when his death, Feb. 18, 1405, saved the independence of China. In his reign of 35 years this chief of a small tribe, dependent on the Kalmucks, became the ruler of the vast territory stretching from Moscow to the Ganges. He was an able administrator, had traits of statesmanship, and patronized science and art. A number of writings said to have been written by Timur have been preserved in Persian, one of which, the *Institutions*, has been translated into English. Timur is made the hero of Marlowe's *Tamburlaine*, the first play in which blank verse appeared on the stage. The name of Tamerlane means Timur the Lame.

Tin, a silvery-white metal, with a tinge of yellowish blue and a high luster. It is softer than gold and can be rolled or beaten into very thin sheets called tinfoil. It is ductile at 212°, when it can be drawn out into wire which is not very tenacious; it melts at 455°; and volatilizes at a white heat. Air and moisture act on tin very slightly. The peculiar properties of tin, especially its malleability, its brilliancy and the slowness with which it rusts, make it very serviceable. With other metals it forms valuable alloys, as bronze, gun-metal, bell-metal, pewter and solder. Tin is very largely used in covering sheet-iron, thus forming tin-plate. Tin must have been one of the metals earliest known, as it enters into bronze of which the oldest metallic weapons and tools are made. The largest tin-mines of Europe are found in Cornwall in England, which once supplied Tyre and Sidon. There are very large tin-deposits in the island of Banka and on the Malay Peninsula, as well as in Australia. The Spanish-Portuguese and the Saxon-Bohemian mountains yield tin. Some tin is found also in Bolivia, Peru, Mexico, India and Chile. The Black Hills, South Dakota, yield about 30,000 tons annually, but we are largely dependent upon foreign sources for our supply of this metal. In 1906 the world's production was 96,196 long tons. Dioxide of tin is the only important ore; when pure it is made of 78 parts of tin and 22 of oxygen. This ore is gray, yellow, red and black and strikes fire

with steel. In Cornwall tin-ore is found in veins running through granite and slate, or scattered in crystals through their mass. The dressing of the ore is a hard and delicate operation. It only yields from ten to 84 pounds of tin-oxide to a ton of material, and is so scattered through the mass that it has to be stamped to a fine powder to separate it. It is then repeatedly washed by machinery to rid it of impurities, is passed through a furnace to separate the sulphur and arsenic, and is then ready for smelting.

Tin'dale, William, an English reformer, was born in Gloucestershire about 1490. He studied at Oxford and Cambridge, and in 1523 began his translation of the New Testament in London; but his sympathy with the Reformation becoming known by his bold speech, he had to flee, going to Hamburg for a year. The first ten sheets of his New Testament were printed at Cologne, and in 1525 at Worms two editions were published without his name. This was the first English printed copy of the New Testament. There was a great demand for it, in spite of the prohibition of the clergy and the abuse of such men as Sir Thomas More, (*q. v.*), who wrote against Tindale. The fifth edition was published in 1529, and in 1534 a revised edition came out with Tindale's acknowledgment of his work. He also brought out a transiation of the Pentateuch, or first five books of the Bible, and wrote *The Obedience of a Christian Man.* Various plots had been made to arrest him, after the first issue of his Testament, and at last officials of the Holy Empire succeeded in having him taken at Antwerp, where he was imprisoned for 18 months and then executed, by strangling and burning, at Vilvorde, near Brussels, Oct. 6, 1536. In November, 1866, a memorial to him was erected at his birthplace in Gloucestershire. The King James' version (1611) of the Bible is based on the translations by Tindale. See *Life* by Demaus.

Tintoretto, Il (*ēl tēn-tō-rĕt'tō*), a great Venetian historical painter, was born in 1512. His real name was Jacopo Robusti, but he was called Tintoretto from the Venetian word meaning dyer, which was his father's trade. He was self-taught, except for a few lessons from Titian. He took as his motto: "The design of Michael Angelo and the coloring of Titian." He sketched so fast that he was called The Madman. Among his famous pictures are *Belshazzar's Feast,* a fresco, *The Last Supper, The Last Judgment, The Slaughter of the Innocents* and *Paradise.* He died at the age of 82.

Tippecanoe (*tĭp'pē-kà-nōō'*), **Battle of,** an engagement fought on Nov. 7, 1811, on Tippecanoe River in what then was Indiana Territory, over which Wm. Henry Harrison was governor, between disaffected Indians and some 800 militiamen and U. S. troops under Harrison. The cause of the native rising, which was incited by an Indian chief named Tecumseh (*q. v.*) and his brother, "the Prophet," was resentment over the seizure and sale of lands in Indiana Territory, which, the Indians claimed, were inalienably their own. Alarmed at the Indian attitude of menace, Harrison marched to and encamped near the Indian town of Tippecanoe. While there his command was attacked at night by a large force of Indians, who however, were beaten off with heavy loss. Harrison's losses were about 185; but his victory made him so popular that many years afterwards in the presidential campaign of 1840, when Harrison and Van Buren were candidates for the presidency, the war cry of the Whigs was "Tippecanoe and Tyler too!" Tecumseh, though not personally present in the battle, lost his influence in the Territory, and later fled to Canada, where he lost his life in the battle of Moraviantown during the War of 1812.

Tippecanoe, a river of Indiana, which rises in Lake Tippecanoe in the northern part of the state, flows southwest 200 miles, and falls into the Wabash, nine miles above Lafayette. On its banks was fought the battle of Nov. 7, 1811.

Tippoo Sahib (*tĭp-pōō' sä'hĕb*), sultan of Mysore and son of Hyder Ali, was born in 1749. He was brought up a Mohammedan, excelled as an athlete, and learned military tactics from the French officers in his father's service. He proved his prowess by routing the British at Perimbakum in 1780 and on Kolerun River in Tanjore in 1782. After being crowned he returned at once to the head of the army and captured Bednor in 1783. In his second war with the English (1790-92) he wasted the Carnatic almost to the gates of Madras, but was at last forced to give up part of his dominions and make peace. The English again attacked Tippoo in 1799, and while bravely defending his capital, Seringapatam, he was killed (May 4, 1799). Tippoo was very popular among his people, who looked upon him as a martyr to the Mohammedan cause.

Tirlemont (*tēr'l-môn'*), a city in Brabant Province, Belgium, 30 miles east of Brussels. Population 17,850. Here the French general Dumouriez routed the Austrians on March 16, 1793, thus winning a most important battle.

Tiryns (*tī'rĭnz*), one of the very oldest cities of Greece, was in Argolis in the Peloponnesus. According to the account handed down, it was founded by Prœtus, a king of Argolis, and its walls were built by the Cyclopes. Here Hercules passed his boyhood. Probably about 468 B. C. the city was destroyed by the Argives. The ruins are one of the finest specimens of what is called cyclopean architecture, and with those of the neighboring city of Mycenæ

(*q. v.*) are the grandest of all in Greece. The walls were over 20 feet thick, formed of unknown stones of enormous size.

Tissot (*tē sō'*), **James Joseph Jacques,** an eminent French *genre* painter, famous for his series of 365 pictures representing the life of Christ, was born at Nantes, Oct. 15, 1836. He was educated at *Ecole des Beaux Arts* in Paris. In 1861 he painted his *Rencontre de Faust et Marguerite,* now in the Luxembourg. The originals are in Brooklyn's Institute of Art. He died on Aug. 9, 1902.

Titanic Disaster. The greatest tragedy in the history of steam navigation occurred shortly before midnight April 14, 1912, in the Atlantic, lat. 41° 46″ N. long, 50° 14″ W., the vessel striking the under-water shelf of an iceberg which had come down on the Labrador current and sinking at 2:20 A.M., April 15. Her wireless call for help was responded to by the Cunard liner *Carpathia.* Of the 2,300 passengers only 705 were saved. The death list included authors, artists, capitalists and other prominent men, who gave up their places in the boats to the women and children, many of whom were passengers in the steerage. The property loss, including the value of the ship, money and other personal property, was $15,000,000. The disaster resulted in important changes in shipbuilding and management. (See SHIPS.)

Titans (*tī'tanz*), **The,** in Greek story, were the sons of Uranus (Heaven) and Gæa (Earth). Urged by their mother, the Titans, headed by Kronos, rose against their father, dethroned him, and set free from Tartarus their brothers the Hekatoncheires (hundred-handed) and the Cyclopes. Kronos made himself king, and for fear he should be dethroned by one of his children as it was foretold he would be, he swallowed each as soon as it was born. The only son to escape was Zeus, who was saved by his mother causing Kronos to swallow a stone wrapped in a cloth, believing it to be his child. Zeus at the end of a ten years' war conquered the Titans and hurled them into a dungeon below Tartarus, surrounded by a brazen wall and guarded by the hundred-handed.

Titian (*tĭsh'an*) or **Tiziano, Vecelli,** one of the greatest of painters, was born at Capo del Cadore, Italy, in the Alps of Friuli, in 1477. His father sent him to Venice to study painting when he was ten. He was very quick at reproducing the special features of any artist's work, and sometimes beat his masters. The completion for the Venetian senate of a picture begun by Bellini, who was one of his teachers, gained him fame and an office worth 300 crowns a year. He became acquainted with the duke of Ferrara and Ariosto, the poet, whose portraits he painted, and on his return to Venice painted one of his grandest pictures, the *Assumption of the Virgin.* Pope Leo X and Raphael invited him to Rome, and Francis I to France. He painted the portrait of Charles V, and spent three years in Spain. There is no complete catalogue of Titian's works, but over 600 of his pictures are known. Far beyond his power as a designer and beyond his gifts of imagination are the splendor, boldness and truth of his coloring. He died at Venice in 1576. See his *Life* by Northcote.

Titicaca (*tĭt'ē-kä'kà*), a South American lake, 12,000 feet above the sea. It lies partly in Bolivia and partly in Peru, and is 100 miles long and about 35 broad. Some remarkable ruins on its small islands seem to belong to a higher civilization than was found in the country when it was conquered by the Spaniards. There are pyramids covering several acres and doorways, pillars and statues sculptured in peculiar style. On the cornice of a doorway is a human figure with a crown of rays and crested serpents. The statues were all on a large scale, and the whole region is strewn with the great sculptured blocks. Two steamers ply on the lake, having been carried in pieces across the Andes in 1871, and a railroad from Arequipa to the lake has been built, which opens the country, with its rich stores of silver, copper and timber and its products of chocolate, coffee and alpaca-wool. See ANDES, ARGENTINA, BOLIVIA, CHILE and PERU.

Tit'lark, a class of small birds, coming between the larks and the wagtails. They live in all parts of the world, building their nests of dry grass, lined with hair, on the ground. The American titlark is a little over six inches long, olive-brown, shading to a yellowish-brown and white, with black bill and feet. In the fields or prairies it often is found in flocks of tens or hundreds running on the ground. The Missouri titlark is the American bird which is most like the skylark of Europe.

TITLARK

Tit'mouse, the common name of a number of small birds related to the warblers. There are about 75 species, found chiefly in the Old World. Four species inhabit the eastern United States. The commonest of these is the well-known black-capped chickadee, which is a winter as well as a summer resident in the southern part of its range. This bird is about five inches long, gray above and white below washed with brown. The

crown and throat are black and the cheeks white. Its familiar call is *chickadee*, and besides this it has a high, sweet whistle of two or more notes. It ranges from Labrador to Indiana and Virginia. In the south it is replaced by a smaller southern chickadee. The tufted titmouse is the largest of the American species, being about six and one fourth inches long. All these birds of America are dull-colored, but some of the true Tits of the Old World are among the brightest birds of the northern hemisphere. For example, the azure tit of Siberia is white and sky-blue; the blue tit of Europe blue, white and yellow.

BLUE TITMOUSE, MALE AND FEMALE

Ti'tus, mentioned in the Bible as a companion of Paul, was a Greek sent from Antioch to Jerusalem to confer with the apostles. He traveled with Paul, going with him to Jerusalem, was sent by him to Corinth, and left at Crete, where, according to tradition, he was made its first bishop.

Ti'tus, Fla'vius Sabi'nus Vespa'sianus, an emperor of Rome, was the oldest son of Vespasian, and was born at Rome on Dec. 30 of A. D. 40. Brought up at the court of Nero, he became well-trained in manly exercises and a good scholar. He saw service as military tribune in Germany and Britain and as commander of a legion in Judæa under his father. When Vespasian became emperor, Titus was left to carry on the Jewish war, which he brought to a close by the capture of Jerusalem in 70 A. D. after a long siege. On his triumphal return to Rome he was received with joy by the citizens, and made a fellow-ruler of the empire by his father. On becoming sole emperor, at his father's death in 79, he at once put a stop to prosecutions for acts of disrespect to the emperor; had informers scourged and banished or sold as slaves: completed the Colosseum and the Baths of Titus; and delighted the people with public games which lasted 100 days. In 79, when the great eruption of Vesuvius took place, which buried Herculaneum and Pompeii; in 80, when a three days' fire laid Rome waste; and during the plague that followed it he despoiled his palaces to aid the sufferers. In this way Titus became one of the most popular of Roman emperors, but in the third year of his reign he suddenly died on Sept. 13 of 81 A. D.. See COLOSSEUM, ROMAN EMPIRE and VESPASIAN.

Ti'tusville, Pa., city in Crawford County 50 miles southeast from Erie. In the vicinity are extensive oil-fields. The first oil-well in the world of which there is any record was struck here in August, 1859. The manufactures consist of oil-refineries, paraffine-works, iron and steel works, machine-shops, foundries, radiator, forge and cutlery works, furniture-factories, sash, blind and chair works, carriage and wagon works, a silk-mill, two large chemical-works and wood-specialty work. The city has a full public-school course, from kindergarten through the high school, parochial kindergarten and elementary schools and Saint Joseph's Academy. Benson Memorial Library and Titusville Hospital are noteworthy institutions, and the city has several churches. Water is supplied from artesian wells, and the city has all the adjuncts of a progressive place. Oil Creek, swollen by heavy rains in 1892, flooded the lower part of the city, causing several oil-tanks to give way. The oil spread on the water, became ignited, and caused damage to property and some loss of life. Titusville has the service of two railroads. Population 8,533.

Tivoli (*tĭv'ō-lĭ* or *tē'vō-lē*), a city of Italy, 18 miles east of Rome, stands on the slope of Monte Ripoli, one of the Apennines. It is a walled town, with a fortress, steep, narrow streets and a cathedral, once a temple of Hercules where Augustus held court. Since the time of Pliny its vineyards have been noted for their fine-flavored grapes, and the *travertino* stone, of which a great part of Rome is built, comes from Tivoli. Near the city are the temple of Vesta, built in 76 B. C., the remains of the villas of Hadrian and Mæcenas and the ruins of early Roman mausoleums, baths and aqueducts. Tivoli was in Roman times called Tibur, is mentioned in 446 B. C., and is said to be older than Rome. It is one of the few towns of Latium still on their old sites. It also was a noted suburb of Rome, Scipio, Marius, Horace and many other prominent Romans having Tiburtine villas. Population 12,880.

Toad, an amphibian animal related to the frog, having a similar structure and life-story. The skin is covered with warts, but the milky secretion is harmless. Toads are more terrestrial than frogs; after they become mature they return to water only to lay eggs, while frogs always remain near the water. Their eggs can be distinguished from those of frogs from being laid in long strings instead of masses of gelatinous substance. The toad is often used for making nature-observations in schools, and is an excellent subject for study. Hodge in *Nature-Study and Life* says: "No aquatic egg is better adapted for such use [study in school-room]. It is large enough to be seen with the unaided eye, develops under all sorts of conditions, and the progress is so rapid that interest is sustained to the end. First the egg elongates, then the tiny, flat tadpoles hatch and, feeding first on the gelatinous matter of their envelope, soon begin to eat the slime in the aquarium and grow with

great rapidity; hind legs appear, fore legs come, the tail is absorbed, and the little toads emerge from the water — all within little more than a month from the time the eggs are laid." The aquarium should have about two inches of moist earth in the bottom and the toads should be fed with a wide variety of insects or bits of fresh meat. The toad is a good friend to man in that it destroys such numbers of insects. Hence it is valuable in the garden. Toads seek moist, shady places and may be found under boards, stones and leaves. The toad has too long been looked upon with superstition and aversion, grown people as well as children agreeing in putting out of the way all toads come upon; in reality, they are harmless, of great benefit to man, and should be protected. The song of the toad, the piping of the male in the spring, is a pleasant sound, called by Hamilton Gibson a "drowsy drool that brings your feet to loitering in the deepening dusk." Consult Kirkland's *Habits, Food and Economic Value of the American Toad.*

Toad'stool. See BASIDIOMYCETES.

Tobac'co, species of *Nicotiana*, a genus of the nightshade family. *N. tabacum* is the best-known species, but *N. rustica* is also much cultivated. The *latakia* of Syria and the commonly cultivated tobaccos of Cuba, the Philippines and the United States belong to *N. tabacum*. Turkish and Hungarian tobacco belong to *N. rustica*. Common tobacco (*N. tabacum*), grows from two to eight feet high. Its leaves are lanceolate, oblong or ovate in shape, from 12 to 42 inches long and eight to 24 wide. They are in turn so attached to the stem that the first is below the ninth and the second under the tenth. A hundred varieties of common tobacco are cultivated, distinguished by color, shape, size and texture of leaves; by fitness for different soils and uses; by different colors in the plants during growth; and by other points. Some ripen in six weeks, others are slow to ripen. Tobacco was introduced to the civilized world by the discovery of America, where the natives were found using it. The valuable properties are found in the leaves, which are dried and cured. More tobacco is produced in the United States than in any other country, but it supplies less than half the tobacco of commerce. Five leading types are grown in this country. Seed-leaf tobacco includes all tobacco for cigars, and is raised in the Connecticut and Housatonic valleys, Florida, Miami Valley, northern Illinois, some counties of central New York, southern Wisconsin and the Susquehanna valley of Pennsylvania. White Burley tobacco is mainly used for making plug and fine-cut chewing tobacco and the lower grades of pipe-tobacco. There also are heavy or dark tobacco and yellow tobacco, Danville, Va., being the greatest market in the world for the latter. This is used for plug, wrappers, high-grade pipe-tobacco and granulated tobacco in cigarets. American perique is grown only in Louisiana. Tobacco demands a strong and heavily manured soil. The soil's color influences that of tobacco, and its elements the quality of the cured product. Tobacco is cultivated much like cabbage. It is cured, that is, has the sap dried out, by airing it or by heating it. It then is prepared for market by sorting it into grades, which number from two to ten according to the variety of the plant; packed and pressed in boxes; and then fermented or sweated in the warehouse. In 1910 the product of the United States was 984,349,000 pounds from 1,213,800 acres, and on the farm it was valued at $91,458,773. Russia in 1909 produced 176,953,000 pounds; Hungary 189,652,000 (in 1909); Japan 91,845,000 (in 1909); Turkey 100,000,000; Germany 62,122,000 (in 1909); Brazil 65,679,000; France 54,610,000; Java 49,100,000; Sumatra 46,500,000; Cuba 59,323,000; and the Philippines 40,258,000. The total product of the world one year was 2,046,817,000 pounds. The value of American tobacco-products in 1905 was $331,117,681. Cigars and cigarets were 64.7% of this value, chewing and smoking tobacco and snuff 35.3%. The making of cigars and cigarets is one of the few factory-industries pursued in every state and territory. New York leads, followed by Pennsylvania, Florida, Ohio and Illinois. It is grown as a commercial product in almost every state of the Union, Kentucky very far exceeding all other states in acreage under cultivation. The next states in order of production are North Carolina, Virginia, Ohio, Pennsylvania and Wisconsin. Outside of the United States the cultivation of tobacco is chiefly in tropical and semitropical countries, *Vuelta del Abajo*, a rich plain in Cuba, producing the finest grades.

VIRGINIAN TOBACCO

Tobacco-Worms, familiar and very injurious larvæ, the young of sphingid moths. They are large, green caterpillars, striped on the side with white and having horns at one end of the body. A northern species, frequently called the tomato-worm, is found in the country generally wherever tobacco is extensively grown, and is the more common form in the northern tobacco belt. The life-story and habits of the two are very similar. The pupa-state is passed underground. In May and June

the moths appear and deposit their eggs singly on the lower surface of the tobacco-leaves. In three days the larvæ hatch, moult five times, feed voraciously, and in about three weeks reach full growth. There usually are three broods a season, though sometimes there are four in the south and but two in the north. The first brood does not do much damage: it is the July brood the planter fears. In fighting it hand-picking has long been in use, but is expensive. Though objections are made to the use of poison, spraying with Paris green is employed, beginning as soon as the new brood appears. Combatting the pest by destroying adult moths is resorted to; the flowers of the jimson weed, previously powdered by a cobalt solution sweetened with molasses, are placed around a field in the evening; the moths come to these, attracted by the smell of the molasses, and are poisoned. The worm has natural enemies, as insect parasites whose larvæ feed upon it before it transforms to the pupa. Worms covered with what appears to be a mass of small white eggs are often seen; the seeming eggs being cocoons of the parasites. These parasitized worms should not be destroyed, but as natural enemies of the pest given all encouragement.

To'cantins' River, Brazil, 1,000 miles long, from the junction of the Almas and Maranhão to the Para, into which it falls. Its branches are the Araguaya, Paraman, Great Somno, Tucahunas and Theresa. The Tocantins is eight miles wide at its mouth, and the tide ascends the river for 300 miles.

Tocqueville (*tŏk'vĭl*), **Alexis Charles Henri Clérel de,** was born at Paris, France, July 29, 1805. He studied law and became a judge at Versailles in 1826. Five years later the French government sent him to the United States to examine the penitentiary system. This mission gave him the chance to study American institutions, and resulted in his writing his masterpiece, *Democracy in America*, one of the very ablest of the many books on America by foreigners. It still is of the highest authority. His other chief work was *The Ancient Régime and the Revolution.* De Tocqueville was in politics from 1839, when he was chosen deputy, till his release from a short imprisonment at the time of Napoleon III's seizure of power in 1851. For five months in 1849 he was minister of foreign affairs. He died at Cannes, April 16, 1859.

Todleben (*tôt'lă-bĕn*), **Franz Eduard,** General, was born at Mitau in Courland, Russia, May 20, 1818. He attended the school of engineers at St. Petersburg. From 1848 to 1851 he was with the Russian army in the Caucasus, fighting the native leader Shamyl. In the Crimean War he became known throughout the world for his defense of Sebastopol. After strengthening the fortifications of Cronstadt and Nikolaiev, he was made chief of engineering in the war-office in 1860. He took a prominent part in the Russo-Turkish War of 1877–8. Todleben wrote a history of the defense of Sebastopol, which has been translated into English and other languages. He died near Frankfort, July 1, 1884. See SEBASTOPOL and SHAMYL.

Togo, Admiral. Heihachiro Togo was born in Satsuma, Japan, 1847. His mother was an educated woman of character and ability; his father was governor of a local province. Little is known of his early boyhood. His first teacher was Takemore Saigo who headed the Satsuma rebellion, and killed himself upon its failure. The spirit of his teaching is expressed in "Where you see faults take the blame of them yourself; where there is merit attribute it to others. Act resolutely, and the very gods and demons shall flee before you." The government sent Togo to England in 1871, where he spent a year as a cadet on the training-ship *Worcester.* Captain Smith described him as "a great plodder; very slow to learn, but very sure when he had learnt." He was made sublieutenant in the Japanese navy but remained at his studies in England until 1878. He rose steadily, and early in his career became known as one of Japan's most daring naval officers. He fully appreciated his country's rights upon the sea and was always ready to defend them. In 1895 he practically began the war with China by firing upon Chinese transports carrying troops with an evidently hostile purpose. The Japanese emperor, at the close of this war, conferred upon him the decoration of the Rising Sun and shortly after made him commander in chief of the standing squadron. On the outbreak of the Russo-Japanese War, 1904, he was appointed commander-in-chief of the Japanese navy, and very ably conducted the operations against Port Arthur. His official report of this action won the admiration of foreign naval officers for its simplicity, directness and modesty. The admiral's greatest victory was in the Battle of the Sea of Japan. He had personally supervised the training of the sailors whose superior marksmanship, at long range on rough water, wrought such terrible destruc-

ADMIRAL TOGO

tion in the enemy's fleet. On May 27, 1905, Togo found his position across the path of the Russian fleet, east of the Tsu Islands in the Eastern Channels, and signaled: "The destiny of our empire depends on this action. You are all expected to do your utmost." The entire Russian fleet was sunk, excepting three destroyers and one cruiser. Togo bears his honors modestly. He lives with his wife and children in an unpretentious house in Tokio, devoting his leisure to hunting, fishing and flower-culture.

Togoland (*tō'gō-land'*) is a German possession between the Gold Coast on the west and Dahomé on the east, with an estimated area of 33,630 square miles and a population of 917,227 Sudanese, Negroes and 232 Germans. There are only 32 miles of coast, but the territory widens inland between Volta and Mona Rivers to four times that breadth. The colony extends 335 miles inland. Lome is the chief port and seat of the imperial governor, and Little Popo, Porto Seguro and Bagida are other seaports. The colony is self-supporting. Commerce is increasing rapidly. The imports are chiefly cotton, spirits, tobacco, wood and iron; the exports palm-nuts and oil and rubber. There are two government-schools with 200 pupils and 141 mission-schools with 5,200 scholars. The natural resources are considerable, and the Germans are pushing development vigorously. Germany acquired Togoland in 1884. Good roads connect many of the principal points, many more are under construction, and a railway is building between Lome and Little Popo. The chief postoffices, at Lome, Little Popo and Agome Palime, are connected by telegraph and telephone with one another and with the Gold Coast and Dahomé. There is a railway between Lome and Little Popo.

Tokat (*tō-kät'*), a city of Asiatic Turkey, 60 miles south of the Black Sea. It is shut in by mountains on three sides, and suffers furnace-heat in summer. There are large gardens and vineyards, copper is smelted, and cotton is manufactured. There is only a small trade, though Tokat once was an important business center. Population about 30,000.

Tokay (*tō-kā'*), a wine made from vines growing in the neighborhood of the town of Tokay, Hungary. The Tokay wine-district covers about 15,000 acres. Great care is taken in assorting the grapes and in preparing the wine, which is brownish yellow while new, changing to a greenish hue as it ages. The yearly yield is about 1,550,000 gallons. The wine-gathering is celebrated by a national festival. Population of the town about 5,100.

Tokio or **Tokyo** (*tō'kē-ō*), meaning Eastern Capital, formerly called Yeddo, is the capital of Japan, and stands in the eastern part of Honshiu, the main island, at the head of Yeddo Bay. The city covers nearly 60 square miles, and is divided into thickly built and inhabited districts, separated by large gardens and groves and cut by canals and moats. In the center is the fortress guarded by stone-walls and a moat, be-

yond which another wall shuts in about three square miles, while a third wall incloses about five square miles. Wide, clean streets lighted by gas; brick and stone buildings; and western merchandise in the stores give Tokio the look of a European city. Shinto shrines and Buddhist temples stand in the cemeteries, and there are four Christian churches. The Imperial University of Tokio, supported by the government, has 260 teachers, exclusive of 16 foreigners, and 4,425 students. There are banks, newspapers, steam-factories, carriages, theaters, telegraph connection with other cities and railroads to Yokohama and Saikyo. Iyeyasu, the famous general and statesman, fixed his seat of government at Yeddo, the "port," in 1600, and here his descendants reigned until 1868, when, as a result of the revolution against the *shogun*, the mikado established his court here and changed the name of the city to Tokio. The city has suffered greatly by fires, and by earthquake shocks in 1656 and 1854. Yeddo was thrown open to settlement by foreigners as the result of the treaty made by Commodore Perry between the United States and the *shogun* in 1854. Population 2,186,079. See JAPAN.

Tole'do, a famous Spanish city, formerly the capital of the country, stands on the Tagus, which surrounds it on three sides, 55 miles southwest of Madrid. It is built on hills 2,400 feet above the sea. The Tagus is its fortress, rushing around it between high and rocky banks and leaving

only one approach on the land-side, which is defended by an inner wall built by Wamba, the Gothic king, in the 7th century and by an outer wall built by Alfonso VI in 1109, both remarkable for the number and beauty of their towers and gates. In the middle of the city rises the high cathedral, surrounded by many churches and convents. This superb cathedral, built in 1492 on the site of a Moorish mosque, though plundered in 1521 and 1808, is remarkable still for its stained glass, sculptured choir and gilded metal pulpits. The famous Toledo blades known in the time of Livy, who wrote about them, were so perfectly tempered that they were sometimes curled up like watch springs and packed in boxes. The Moors captured Toledo in 714; it became a part of Castile in 1085. In the heyday of its career it is said to have sheltered 200,000 people. Toledo also is a province, with an area of 5,919 square miles and a population of 376,814. Population of city 23,317.

Toledo, O., was organized in 1833 by the union of the villages of Port Lawrence and Manhattan. It is on both sides of Maumee River, near its mouth, and covers nearly 30 square miles. There are points in and about Toledo of historic interest. Anthony Wayne, Wm. H. Harrison, Commodore Perry, General Proctor and the Indian chiefs Pontiac, Little Turtle and Tecumseh made Toledo and the Maumee valley of interest to students of history. In 1910 there were only 29 cities in the United States with a larger population. Toledo ranks third in population in Ohio, and is destined to become a great commercial center. It is at the southwestern extremity of Lake Erie, and is, therefore, the natural lake-port for the trade and commerce of the Ohio and Mississippi region, including the greatest corn-growing belt in the world, the oil and coal fields of Ohio and Indiana, the salt, lumber and iron of Michigan. The Ford Plate-Glass works, the Libby Glass factory, the National Malleable Castings Company, the oil-refineries, the automobile factory of the American Bicycle Company and the Craig Ship-yards are some of Toledo's leading industries. There are about 40 million dollars invested in the city's manufactures, which have an annual yield of about $45,000,000. Pop., 168,497.

Toledo is a city of beautiful homes. It has a fine system of parks and boulevards; its street-car system, 26 railroads and steamboat and electric lines give rapid transit to all parts of the country. Its modern school-system is among the best in the United States. It was organized in 1898 upon the federal plan of government. The city supports a fine public library, Toledo University, two high schools, a city normal school, manual-training schools for high school and elementary departments, 40 primary and grammar schools; enrolls 22,000 pupils; and employs about 500 teachers. Population estimated at 184,740.

Tolstoi (*tŏl'stoi*), Count **Leo** (or **Lyof**) **Nikolaivitch,** an eminent Russian novelist and social reformer, was born at Yasnaia Poliana in the government of Tula on Aug. 28, 1828, and was educated at the University of Kasan (Russia in Europe). Early in life he was a soldier, and served in the army in the Caucasus and in the Crimea, where he was present at the battle of the Tchernaya and at the storming of Sebastopol by the allied forces. This experience enabled him to write with such graphic force not only his narrative on *Sebastopol*, but his tale of Napoleon's invasion of Russia, entitled *War and Peace*. *Anna Karénina*, a tale of guilty passion, placed him among the masters of fiction. This was followed by a number of works which have earned for him the title of the Prophet of Renunciation, and led him to lead the life of an anchorite, toiling on his land with his own hands, sharing his crust with the humblest, in rigid obedience to Christian precept. He was an uncompromising opponent of coercive government and a bitter arraigner of modern society. His other writings embrace *My Religion*, *Resurrection*, the *Kreutzer Sonata*, *Master and Man*, *My Life*, *My Confession*, *Patriotism and Christianity*, *The Christian Teaching*, *The Kingdom of God Within*, *The Four Gospels Harmonized and Translated*, *What is Religion* and *The End of the Age*. See Ward's *Gospel of Count Tolstoi in Prophets of the Nineteenth Century*. Died Nov. 20, 1910.

COUNT LEO TOLSTOI

Tol'tecs. See MEXICO.

Toma'to, a favorite vegetable or fruit (popularly called love-apple) which ranks perhaps next to the potato in the extent of its consumption. It is a native of the warmer regions of the American continent and is raised largely as a canned vegetable for table-use. It is grown best in a sandy, well-fertilized soil; and may be grown from seed or from cuttings. If from seed, the tomato should be raised under glass and later transplanted to field or garden, care being taken to guard the plant from frosts. The plants while maturing should be supported on stakes or wire-trellis to keep the fruit from the ground and remove danger from rotting.

Tomato-Worm. See TOBACCO-WORM.

Tombig'bee, a river of Mississippi and Alabama, which rises in the northeastern corner of Mississippi, receives the Black Warrior and, by its junction with the Alabama, forms Mobile River about 45 miles above Mobile. It is about 450 miles long, and is navigable for large steamboats to Columbus, Miss., 366 miles from Mobile Bay.

Tomp'kins, Daniel D., an American politician who became vice-president of the United States in 1816 and in 1820, was born in what now is Scarsdale, in Westchester County, N. Y., on June 21, 1774. He studied at Columbia College, and, after graduating, was in 1797 admitted to the bar. In 1805–7 he was a justice of the supreme court of the state. after which he became governor for about ten years 1806–17). In 1812 he somewhat arbitrarily prorogued the legislature to prevent the charter of the Bank of America, with a capital of $6,000,000, alleging bribery. He took an active part in the War of 1812, recruiting and equipping well-nigh 40,000 of the state's militia and aiding the state with money raised by his own security. As governor one of his last acts was to recommend the abolition of slavery in the state. He died on Staten Island, N. Y., on June 11, 1825.

Ton'awan'da, N. Y., a city in Erie County, on Niagara River and Barge Canal and on N. Y. Cent. and Hudson River, Erie and Lehigh railroads, ten miles north of Buffalo. Adjoining North Tonawanda, with which it is connected by a bridge over Tonawanda Creek, it also has connection with Buffalo by two electric tramways. It has a fine park, an armory, public library and high school. Its industries, which utilize Niagara River for water-power, include lumber-manufacturing, a paper-mill, iron-works and ship-yards. Settled about 1820, the town became a city in 1904. Population 8,290.

Tongue (*tŭng*), a muscular organ, reaching from the hyoid or tongue bone, backward and downward and in front to the teeth. The upper surface, borders and front third of the lower surface are free; while the remaining parts are fixed to neighboring parts by the covering of mucous membrane. At certain points this membrane, on leaving the tongue, forms folds containing fibers, which act as ligaments to the tongue. The largest of these folds is called the *frenum* or bridle of the tongue, and joins its free front end to the lower jaw. This bridle limits the backward movement of the tip of the tongue. In rare cases it reaches to the tip, so as to interfere with speech and chewing, and the child is said to be tongue-tied. The upper surface is divided into two parts by a middle, lengthwise furrow. (For the little hills on the top of the tongue see TASTE). At the back of the surface are mucous glands, reaching into long canals and helping to secrete the fluid that moistens the tongue. The furrow on the under surface is deeper, with veins running forward on each side of it. The base of the tongue becomes wider before being fixed in the tongue-bone, which, with the ligaments, is the tongue's framework. There are two sets of muscles, the extrinsic or outside muscles, which fasten the tongue to certain points and move it on them; and intrinsic or inside muscles, which pass from one part of the tongue to another, make up its chief bulk and move it on itself. By the action of the various muscles the whole tongue may be drawn back; its upper surface be hollowed or bowed or pressed against the roof of the mouth; its tip may be thrust straight out or sideways, upward and downward or into a hollow tooth where food might lodge. See TASTE.

Ton'ka Bean. See VANILLA.

Ton'quin or **Ton'kin,** a dependency or protectorate of France in French Indo-China, acquired in 1884. Its area is 46,000 square miles, with an estimated population of close upon 10,000,000. It is south of China proper with Burma on the west, Siam and Anam on the south and the Gulf of Tonquin on the east, enclosed from the south China Sea by the island of Hainan. It is traversed by Song-Koi or Red River, on which is Hanoi, the capital and largest city, the seat of the resident superior of the protectorate and of the governor-general of French Indo-China. Its chief port, on the Gulf of Tonquin, is Haip-hong, which has a fine harbor and is connected by a railway, 60 miles in length, with the capital; while another line runs inland for 200 miles to Vinh. The forests of the dependency are rich in ebony, sandal-wood and iron-wood; while the vast lands of the delta yield rice, sugar-cane, mulberry, bamboo and areca-nut; the mountainous parts produce coffee, tobacco and indigo. Jute has recently been cultivated considerably; while other exports include oils, pepper, animal-products, silk and rice. Among its useful animals is the buffalo. Before the French protectorate was established, the region formed a part of the Anamese kingdom, now also embraced in French Indo-China. On the coast, which is a vast marshy stretch, are coal-beds estimated to be from 300 to 400 square miles in extent. Formerly the country was infested by predatory Chinese soldiery, known as "Black Flags" and supposed to be escaped bands of the Taiping rebels. See ANAM, CAMBODIA, COCHIN-CHINA, LAOS, SHAN and SIAM.

Toombs, Robert, American politician, member of the Confederate Congress (1861) and Confederate secretary of state, was born in Wilkes County, Ga., July 2, 1810, and died at Washington, Ga., Dec. 15, 1885. After graduating at Union College and studying law at the University of Virginia, he was elected to Congress in 1844, and in

1850 contributed to the passing of the compromise measures. From 1853 to 1861 he was a member of the United States senate, a southern extremist and leading disunionist. In 1861 he became secretary of state in the Confederate government, but resigned to accept the commission of brigadier-general on the southern side. He was at the second battle of Bull Run, was at Antietam in 1862 and in 1864 commanded the militia of Georgia. After the war he lived abroad till 1867, denouncing strongly the reconstruction measures of Congress, and on his return to the south he refused to take the oath of allegiance to the United States government. Consult Trent: *Southern Statesmen of the Old Régime.*

Ton'ty, Henri de, an Italian explorer of great resolution and courage and a companion of La Salle, was born about the middle of the 17th century and died at Fort Louis (Mobile) in 1704. He served both in the French army and the navy, was with La Salle in Canada, effected the first settlement in what now is Illinois, and accompanied La Salle on his famous voyage down the Mississippi to its mouth. He returned for supplies; and in 1686 again descended the Mississippi in search of La Salle. He is identified with the early history of Illinois (until 1702) and of Louisiana. His memoirs were published in Paris in 1897. Consult Parkman's *Discovery of the Great West.*

Top. The ordinary spinning-top is a rapidly rotating solid supported on a single point below the center of gravity. Suspended in this way the weight of the top acting through its center of gravity exerts a moment of force which tends to tilt the top. The result is that the top "precesses," instead of falling over, thus exhibiting those phenomena so well-known to every boy of ten. For a detailed explanation of the dynamics of the top consult Worthington's *Dynamics of Rotation,* chap. xiii, or Perry's *Spinning-Tops.* Clerk-Maxwell devised a top having more or less the shape of a bell, so that the point of support could be placed at, above or below the center of gravity. It is provided also with adjusting screws as shown in the accompanying figure, so that its mass can be distributed in various ways about the axis of rotation. The chief interest attracting this particular form of top, besides the fact that it most beautifully illustrates the general principles of rotation, lies in the fact that it accurately simulates the motion of our earth on its axis, demonstrating on a small scale the phenomena of precession, nutation, variation of latitude dynamic and static instability etc. Consult Maxwell's original account in his *Scientific Papers,* Vol. I., pp. 248-68, and a detailed and popular account in *The Physical Review,* Vol. VI., March, 1898. See Gyroscope.

MAXWELL'S DYNAMICAL TOP

To'paz, a mineral and a gem, the finer varieties of which are much valued for their luster and the beauty of their colors. It is made up chiefly of alumina, silica and fluorine. It is usually found in very old rocks and in most parts of the world. Fine topazes are found in Ceylon, but those most prized come from Brazil. Topaz either is colorless or in many shades of red, blue, green or yellow; it is translucent or almost transparent on the edges; and it is harder than quartz. When cut or set, topazes are easily mistaken for diamonds or rubies, but they are not so hard as either of these gems.

Tope'ka, Kas., capital of the state and county-seat of Shawnee County, is built on both sides of Kansas River, 67 miles west from Kansas City and 300 from St. Louis. The surrounding country is a rich, rolling prairie. It is a large milling-center, and has manufactures with a yearly output of $10,000,000. It also is an important railroad and distributing point, being served by the Santa Fé, Rock Island and Union Pacific main lines and a branch of the Missouri Pacific. It has electric street-railroads, broad streets and handsome churches and buildings. Among the public buildings are the capitol, United States government building and the state asylum for the insane. Besides these Topeka has two handsome buildings belonging to the Y. M. C. A., and the railroad Y. M. C. A., a splendid auditorium and 71 churches. The free public library has 10,000 volumes, the Kansas Historical Society library 40,000 volumes, and the state library 28,000 volumes. The public-school system is excellent and includes high and manual-training schools, while among its schools of higher learning are Washburn College (Cong.), founded in 1865, having 720 students; an Episcopal college for women; and a Roman Catholic seminary. Topeka was settled in 1854, and became the capital in 1861. The city owns the electric street-lighting plant and its water-works, while the Topeka Edison Company furnishes light, power and heat for commercial and domestic uses. Topeka is also supplied with natural gas, which is distributed for domestic and manufacturing uses. Population 43,684.

Top'lady, Augustus Montague, was born at Farnham, Surrey, England, Nov. 4, 1740. He went to Westminster School and Trinity College, Dublin, became a clergyman, and preached in Devonshire and in London. For a time he was editor of a religious magazine, and he published religious books. He is remembered as a hymn-writer, especially as the author of *Rock of Ages.* Toplady died at London, Aug. 11, 1778.

Torna'do. See STORM.

Toron'to, Can., capital of Ontario is on the northern shore of Lake Ontario. The harbor at its front is formed by an island lying south of it. We first hear of it as a trading-fort built by the French in 1749 and named Fort Rouille. Later it was known as York. It was incorporated as a city in 1834 with the name of Toronto. It is the legal, educational and legislative center of the province. Osgoode Hall with its court-rooms and law-library, named after Chief Justice Osgoode and centrally located in spacious grounds, is a center of attraction for visitors. The parliament-buildings, stately and handsome brown-stone structures in the park, and the group of buildings near by, devoted to the growing work of the University of Toronto, deservedly are objects of local pride. The main building of the university is, architecturally, one of the most imposing on the continent. Near these are Wycliffe, McMaster, Victoria and St. Michael's Colleges and, at no great distance, Knox and Trinity Colleges. The educational institutions attract 10,000 students. Only a few universities in the world have a larger roll-call than Toronto University. The city rises gradually from the lake northwards, and a number of streets in its northern portion, the residential part, are noticeably beautiful. Industrially Toronto is making great progress. The value of the annual output is near $100,000,000. One department-store alone (T. Eaton Company) employs 4,000 hands. In 1906 electric power was brought to the city from Niagara Falls, and cheap power unlimited in quantity so easily obtained will attract capital and further build up industries. The city is well-provided with hospitals, libraries, churches and parks. Its electric railway has nearly 100 miles of track, and each year carries nearly as many millions of passengers. The leading railways, the Canadian Pacific, Grand Trunk and Canadian Northern, contribute to its growth. Steamers, passengers and freight cross to Niagara (Lake Erie) and to Kingston and points east, including Montreal and Quebec, across Lake Ontario. Americans in great numbers visit Toronto each summer. The island, stretching along the front of the city, dotted with summer residences and hotels and overlooking the great lake, is attractive to citizens and visitors alike. Its ready accessibility (within a few minutes of the heart of the city) makes it a most valuable asset. Population (1910), 342,000. See CANADA and ONTARIO.

Torpe'do, the popular name for electrical fishes closely related to the skates and rays. They are capable of giving electrical shocks, and are also called cramp-fishes. There are 15 or 20 species inhabiting mainly the warmer seas, but one species is found on the Atlantic coast from Cape Cod south. It has a broad, disk-shaped body with a stout tail and reaches a length of three to five feet. It is black above and whitish below. The electrical organs in all these fishes consist of two clusters of six-sided prisms, one on each side between the head and the broadly expanded pectoral fin. There are about 500 prisms in a single organ. The latter is richly provided with nerve-fibers, and the discharge is under the control of the fish.

Torpedo, an apparatus or machine designed to destroy ships by blowing them up with an explosive. Torpedoes are either stationary, floating or moving. Stationary and floating torpedoes are used in defensive operations, as in harbors or rivers. They are placed in the harbor, either being anchored or allowed to drift within certain limits, and so arranged that they explode by contact with a ship or can be exploded by an electrical contact from some convenient point. Moving torpedoes are projected through the water, either on or below the surface, and explode upon coming in contact with a ship. They may depend for motion wholly upon the original force of projection, or they may be supplied with some motive power by which they move themselves. When they are projected, they are usually discharged by compressed air from a long tube called a torpedo-tube. Many war-ships are fitted with these torpedo tubes, but special boats called torpedo-boats and submarines are more often used for the purpose. A torpedo-boat is a small, fast steamer fitted with appliances for launching torpedoes. Larger steamers having great speed and equipped with fast-firing guns are employed for protecting the large cruisers and battleships from torpedo-boats. Such boats are called torpedo-destroyers. Torpedo-destroyers are also supplied with torpedoes and torpedo-tubes for offensive operations. The use of torpedoes in warfare dates back to the 16th century, when floating torpedoes were used to blow up bridges, etc. During the American Revolution floating torpedoes were tried with little success against Lord Howe's ships, both in New York harbor and on the Delaware. During the American Civil War the Confederates made large use of torpedoes as a means of defending their ports, and 24 Federal war-vessels and transports were destroyed by torpedoes.

The importance of the submarine as a feature of naval warfare was fully demonstrated in the

European War. The chief disadvantage of the torpedo-boat is its visibility while the submarine is a torpedo-boat which is able to fire while submerged.

On sighting the vessel which it is proposed to attack, the funnel of the submarine is taken down, openings closed, protective coverings of the tower removed, the lid of the entrance-way closed, sufficient water admitted into the tanks in the outer hold to cause the vessel to sink out of sight, leaving exposed only the periscope—a mere dot in the expanse of waters; the whole operation occupying only about five minutes.

While for many reasons there are few of us who would enjoy a trip in a submarine, even in times of peace, the following description of such an experience during naval maneuvers is interesting:

"The boat glides slowly forward at a depth of thirteen meters. One can see but a few meters distant through the clear window glass; all else is obscured by the density of the water as if by a green veil. A little silver ball rushes obliquely upwards; a bubble which some large fish may have made. A swarm of sprats crosses our path, standing upright in the water like pegs; it is their mating season, and they do not allow themselves to be disturbed by our passage. And jelly-fish—jelly-fish in masses! A great violet one hurriedly draws itself together, while a pair of long bands, like torn off ribbons, stream out behind. Others sail about, some of a bluish color, others a delicate alabaster tint. The sun must be shining overhead for everything mounts upward as if to the light; but this may be due to the displacement of the water caused by our passage, which makes everything seem to rise."

The experiences of the European War (q.v.) demonstrated so clearly the value of submarines that a considerable increase in submarines was a part of the U. S. "preparedness" program. The study of submarines is carried on with great secrecy. The American naval school for this work is at Willet's Point in New York harbor. See NAVY.

Torpedo-Boat. See TORPEDO.

Torquemada (*tôr kā-mā'thä*), **Tomás de,** a Spanish monk, was born at Torquemada, Spain, about 1420. He was a Dominican friar, and was made inquisitor-general for Spain in 1483 He is famous as the organizer of the Inquisition, with its tribunals at Seville, Cordova and Toledo. He was too zealous even for the persecuting spirit of the age, and Pope Alexander VI appointed four colleagues to hold him in check. He obtained the expulsion from Spain of the Jews and Moors. He died at Avila, Sept. 16, 1498.

Tor'rey, John, an American botanist, was born at New York, Aug. 15, 1796. While studying medicine in New York, he founded the Lyceum of Natural History. He was professor of natural sciences at West Point for three years, of chemistry at Princeton, and also had the same chair in the medical college at New York. His reputation as a chemist brought him the position of United States assayer, which he held for nearly 20 years. The results of his work or the state geological survey of New York and on several United States exploring expeditions are found in *Catalogue of Plants Growing within Thirty Miles of New York City, Flora of New York, Flora of the Northern and Middle States* etc. His fine botanical library and the collections of 40 years he gave to Columbia College, New York City. He died on March 10, 1873.

Torricelli (*tŏr'rē-chĕl'lē*), **Evangelista,** an Italian physicist, especially remembered as the inventor of the mercurial barometer. He was born at Faenza, Oct. 15, 1608, and died at Florence, Oct. 25, 1647. His work was largely inspired by the writings of Galileo, whose pupil and private secretary he was during the last three months of Galileo's life. Torricelli substituted mercury for water in the barometer and found that it rose only 30 inches instead of 33 feet in a closed tube. This led him to the conclusion that in each case the cause of the ascent is the pressure of the earth's atmosphere. This conclusion was shortly afterward clinched by Pascal, who carried a barometer to a mountain-top and found that the mercury fell as he ascended. Besides two important theorems in the mechanics of solids, Torricelli enunciated the theorem that a liquid flows from an orifice with the same speed that it would have acquired in falling freely from the surface of the liquid to the level of the orifice. See BAROMETER.

Tor'rington, Conn., a town and borough in Litchfield County, on Naugatuck River and on the New York, New Haven and Hartford Railroad, 17 miles north of Waterbury and 25 west of Hartford. Settled in 1737, three years later it became a town, and in 1887 was incorporated as a borough. It is actively and largely interested in manufactures, aided by the facilities of good waterpower. Among its products are woolen goods, machinery, iron and brass castings, plated goods of copper, nickel, silver and gold, furniture, bicycles, needles and machine-tools. Its public buildings include a library, high and elementary schools, municipal buildings and churches. It also has the fine park called Coe Memorial Park. Population about 16,840.

Tortoise (*tôr'tĭs*), a name loosely applied to any turtle, but more correctly restricted to particular members of the turtle family. The true tortoises are land-turtles, represented in the United States by the wood-tortoise, the box-tortoise and the burrowing turtles of the southern states. They feed upon plants and fungi. Their shell usually is highly arched, with the hard plates showing concentric markings. Their nearest relatives are fresh-water species like

the painted and speckled turtles, which sometimes are incorrectly called tortoises. The so-called tortoise-shell comes from a

BOX-TORTOISE

salt-water turtle, called the hawksbill. See TERRAPIN and TURTLE.

Tortug'as. See DRY TORTUGAS.

Tor'ture, a means of extorting confession of guilt by inflicting severe pain. It was used at first on slaves, and with the Romans on those who were not Roman citizens. Paul protested against the use of it, saying: "Is it lawful to scourge a man that is a Roman uncondemned?" Under the emperors the use of it became general, extended through Europe, and reached its severest form in the tribunals of the Inquisition. The scourge; the rack, which stretched the whole body, sometimes until the joints were dislocated; the boot, rings of iron around the legs with wedges driven in until the flesh was mashed to a jelly; and the thumb-screw were among the many hideous instruments used. Judicial torture in England was inflicted only by order of the sovereign, and the last use of it was in 1640. France abolished it in 1786; Russia in 1801; and Austria, Prussia and Saxony about the middle of the 18th century.

To'rus (in plants), the same as "receptacle." See FLOWER.

Toscanelli del Pozzo, surnamed Paul the Physician, was born in Florence, Italy, 1397, and died there in 1482. He distinguished himself as an astronomer and physician. For a number of years he had charge of the celebrated library founded at Florence by Nicolo Nicoli. He read the accounts of the travels of Marco Polo and met many travellers from foreign lands. These experiences, with his knowledge of astronomy, convinced him that a western route to the Indies was possible. He corresponded with the king of Portugal and with Columbus on the subject, and prepared maps to show the proper course for such a voyage. These papers were in possession of Columbus in 1492.

To'tal Ab'stinence or Tem'perance. The abuse of intoxicating liquors early led to the formation of temperance societies to influence public opinion on the subject and help those who were endeavoring to overcome the appetite for strong drink. The first temperance society in the United States was formed at Litchfield, Conn., in 1789 by 200 farmers who pledged themselves not to use liquors in carrying on their farmwork. Early in the 19th century the temperance movement became organized, and the churches, especially the Methodist and Presbyterian, were active in the work. The Massachusetts Temperance Society was formed in 1813, and the American Temperance Union in 1826. The early societies were temperance societies strictly, not total abstinence organizations. They did not oppose the use of wine, cider or malt liquors, a brewery being built in Boston by the temperance reformers. The first national temperance convention met in Philadelphia in 1833, and formed a national temperance union, with 23 state societies and over 7,000 other societies. "Total abstinence from all that intoxicates" was first insisted on in 1833 by the Massachusetts Society.

The Washingtonian Temperance Society was formed by six reformed drunkards at Baltimore in 1840, and was very successful in its special work of reforming hard drinkers. The Sons of Temperance was another society which in 1850 numbered about 240,000 members. The Good Templars, another temperance order, founded in 1852, is a secret society with passwords, grips etc., with a membership of about 750,000. A remarkable movement in the temperance cause is what is known as the crusade, which began in Hillsboro and Washington Court House, O., in 1873. It was a crusade of women against saloons, and the weapons used were prayer, persuasion and persistence. The movement spread rapidly and was the means of closing many saloons, in some places all that were in operation. The Woman's Christian Temperance Union is the successor to this temperance crusade. It has organizations in every state and territory of the United States, fifty other nations including Great Britain, Germany, Canada, Australia, New Zealand, India, Japan, China, Madagascar and South Africa.

Its work includes 35 departments. It has been active in distributing temperance literature, in making temperance study a part of the curriculum in the public schools, in the establishment of homes for girls and in securing laws forbidding the sale of tobacco to children. It is agitating for an eight-hour day, peace through arbitration, industrial education and social purity. Its efforts for constitutional prohibition and for total abstinence by individuals are best known. The badge is a

bow of white ribbon. The headquarters are at Evanston, Ill., under the same roof with the former home of Miss Frances E. Willard (*q. v.*). Its work is supplemented by that of the Catholic Total Abstinence Union, which has 100,000 members, both men and women.

The first laws against the use of liquor were made in Massachusetts in 1639 and about the same time in Connecticut. Oglethorpe in 1733 had the importation of rum into Georgia prohibited as well as of slaves. In 1756 a duty was imposed on imported liquors in Pennsylvania, and in 1774 the first Continental Congress proposed to the different states the passage of laws to stop the distilling of liquors. The ration of grog in the army was changed to coffee in 1832. License laws were passed in some states, but met with strong opposition. After the supreme court had in 1847 decided in favor of prohibitory laws, Maine was the first state to use the power. Delaware, Rhode Island, Vermont, New Hampshire, Massachusetts, Michigan, Iowa, Indiana and Kansas all passed laws prohibiting the sale of liquors, but the law was repealed later in most of the states and license laws substituted. The Prohibition party grew up from the effort to induce state and national legislation favorable to prohibition.

In recent years the liquor problem has been severely scrutinized all over the world. The open bar is more and more regarded as a nuisance, an injury and a peril to society and the state. Consequently public opinion against the saloon has made itself felt throughout Europe as well as in America, Canada, Australia and New Zealand. Both Great Britain and the United States are increasingly limiting the number of places at which intoxicating liquors are retailed and reducing the area of the influence of drink. In 1904 English local magistrates were given power to refuse to renew licenses for saloons that they consider needless, compensation being given to the ousted liquor-dealer, and in 1908 it was enacted that after 1922 compensation shall *not* be paid and that magistrates shall be free to close as many houses as they see fit. Since April 5, 1909, the people in any locality have had the power to prohibit the granting of any *new* license. In the United States, however, greater progress has been made in regulating the liquor-traffic than in any other country. One of the efficient organizations under which the crusade has been carried forward since 1903 is the Anti-Saloon League, the platform of which has but one plank — *The Suppression of the Saloon.* It thus has the support not only of those of strict temperance views, but of large numbers who, while not total abstainers, are alive to the evils and the menace of the open saloon. The effort of the Anti-Saloon League has been to secure the enactment of local option laws, under which the voters in village, town, township, city, county or state may determine by a majority vote whether or not intoxicating liquors shall be sold in the political division in which the vote is taken.

When the aggregate of prohibition districts under local option is sufficiently large the next step is taken—adoption of a constitutional amendment. In nearly all the states there is now some form of local option; and the territory under prohibition has steadily increased so that it now includes more than half the states of the Union.

One of the most remarkable events, not only in the history of prohibition, but of all social reform, was the abolition of the liquor traffic in Russia in 1914, following the outbreak of the European War. The imperial decree effected, almost immediately, a complete transformation in the life of the people—of which a forty per cent decrease in crime may be taken as an example—and gave a tremendous impetus to the prohibition movement throughout the world.

To'tem, a carved or painted symbol, in use among the American Indians and the primitive peoples of foreign lands to indicate kinship and the special tribe to which they belong. These symbols are very varied in character, including things inanimate, as trees, plants and the heavenly bodies — the sun, moon or stars; as well as objects of animate life, as birds, beasts and fishes. These, when adopted, become the hereditary tribal mark and the indication of clanship, and are not only found on the tribal totem pole, but are frequently indicated on the person of members of the same tribe by tattooing or burning the rough symbol into the skin. These totems are sacred to the tribe adopting them, and in the case of animal, bird or fish life, they are withheld from eating or destroying them. They thus become a sort of blood-bond, and in some instances they restrain marriage among those who adopt a certain tribal symbol or totem. A considerable literature deals with the subject of totemism in different lands, as well as with kinship and marriage and the tribal customs among early races of mankind.

Toucan (*tōō'kan*), the name for birds with enormous, bright-colored bills, inhabiting South America and ranging as far north as Mexico. The bills are light, as they are filled with air-cavities. These birds feed on bananas, insects and reptiles. They frequent lofty trees. They are sometimes confused with the horn-bills of Africa, birds with greatly enlarged bills but belonging to a different family.

Touch (*tŭch*), that one of the five senses by which contact or pressure is perceived. It also is usually made to include the senses of temperature and pain. It is possessed more or less acutely by all parts of the free surface of the body, walls of the mouth and nasal passages. Its delicacy

depends upon the number of particular touch-organs in a square inch and also on education. The blind, for example, can be taught to read by passing their fingers over raised letters, and physicians and some artisans acquire an educated touch of remarkable acuteness. Touch is most accurate in the tip of the tongue; the palm of the forefinger stands next; and the back is the least sensitive to contact. The whiskers of cats and other similar organs increase the efficiency of this sense. As regards the temperature of sense, it has been shown that there are distinct hot and cold spots lying close together on the surface of the skin.

Toulon (*tōō'lôn'*), a city of France, on the Mediterranean, 30 miles southeast of Marseilles. It is on a double bay, sheltered by mountains, and has the largest military port on the Mediterranean, covering 240 acres, with large buildings, arsenals and floating docks. The cathedral, town-hall, military and naval schools and theater are among its finest buildings. Shipbuilding and the trade connected with the military and naval works are the principal industries of the city. Toulon was used as a harbor by the Romans. The fine fortifications built to protect the city from pirates withstood an attack of the English and Dutch fleets in 1707. The English captured the city in 1793, but were driven out by Napoleon. Population 103,549.

Toulouse (*tōō'lōōz'*), a French city on the Garonne River, 130 miles southeast of Bordeaux. The beautiful church of St. Sernin, the cathedral, a fine museum of art, a public library, an observatory and an arsenal are among its attractions. It has manufactures of woolen and cotton goods, cutlery and hardware. Toulouse was the capital of the Visigoths in the 5th century. From the 8th to the 13th century it was governed by counts or dukes, and was then attached to the French crown. The battle of Toulouse, in which Wellington was victorious over the French under Soult, was fought on April 10, 1814. Population 149,438.

Tourgée (*tōōr-zhā'*) **Albion W.,** an American author, was born at Williamsfield, O., May 2, 1838. He studied at the University of Rochester, N. Y.; enlisted as a private in the 27th New York volunteers; was wounded at Bull Run and at Perryville; and was held a prisoner for four months. He moved to North Carolina, where he was prominent in the reconstruction of the state, drawing up the constitution and aiding in the revision of the laws. His writings, besides legal works, include *Toinette*, *Figs and Thistles*, *A Fool's Errand* and *Bricks without Straw*. In 1897 he was appointed consul to Bordeaux, France. He died on May 21, 1905.

Tourmaline (*tōōr'mȧ-lĭn*), a mineral found in granite, gneiss and sometimes in sandstone. The color varies according to the materials tourmalines are made of. The blue, pink and green ones have little iron, while the black ones probably are colored by iron. Silica, boric acid, alumina, lithia, soda, lime, magnesia etc. enter into their composition. Tourmaline is found in Maine, Massachusetts, New Hampshire and Vermont in red, green and blue crystals, while brown ones are found in New York and very fine black ones in California. In the Ural Mountains, the island of Elba and the St. Gothard fine specimens are found. See *The Tourmaline* by Hamlin.

Tournament (*tōōr'nȧ-ment*), a military festival or contest. They were usually contests between knights on horseback, and the name came from the skill needed in turning their horses. If only two knights contended, it was called a joust; but several combatants made it a tournament. Invitations to a tournament were given by princes or nobles through heralds, and the attending knights came with large retinues and gay banners, while crowds of gaily dressed spectators filled the seats around the place of contest. The rules of the tournament prescribed the kinds of weapons to be used, the mode of warfare and the rank of those who might enter the lists. The prizes awarded by judges were given by the ladies. The early tournaments were like the gladiatorial shows in Rome, often resulting in the death of the combatants, and were for a time forbidden in England and opposed by the church, but during the crusades they came into favor and flourished as court pageants until Henry II of France received a fatal wound, when they were abolished in Europe. See *Ivanhoe* by Scott.

Tours (*tōōr*), a French city, at the junction of the Loire and Cher Rivers. The finest bridge in France crosses the Loire. There are two towers standing of the famous Church of St. Martin. Tours is known for its silk-manufactures, being the first place to introduce the trade, which was so extensive that it had 80,000 inhabitants when the repeal of the Edict of Nantes drove away its best artisans. The states-general of France met in Tours at different times during the 15th and 16th centuries. It was occupied by the Germans in 1871. Population 67,601.

Toussaint (*tōō'săn'*), **François Dominique,** called also L'Ouverture, the black chieftain of Haiti, was born of slave parents near Cape François, Haiti, in 1743. In 1791 the mulattoes and blacks made a struggle for their rights, and Toussaint, after helping his master to escape with his family to Baltimore, joined the army and soon became a general, capturing the white army without bloodshed. The black leaders at first accepted the help of the Spaniards, but when the English invaded the island,

where French and Spanish and colored troops were all contending, Toussaint declared for France, which had proclaimed freedom for the slaves. He joined the French leader, drove the English and Spanish from the island, and was made commander-in-chief of Santo Domingo. The civil war between the mulattoes and blacks ended in the whole island becoming subject to Toussaint, who governed it under the French. He selected a council of nine members, composed of eight white citizens and one mulatto, which chose him president for life. The constitution adopted was sent to France; but Napoleon, the first consul, said: "He is a revolted slave whom we must punish." A fleet of 30,000 men and 66 war-vessels was sent to Haiti to re-establish slavery, and after ineffectual efforts to conquer the island offers of peace were made, promising with solemn oaths the liberty of the people and that Toussaint should be retained in power. He signed the treaty of peace on these conditions, but was seized treacherously with his family, and sent to France, where he was imprisoned without trial or accusation in a cold, underground dungeon at Besançon. He sent appeals for trials and his defense to Napoleon, but got no answer. At last, worn out with cold and left four days without food or drink, he was found dead in his cell on April 27, 1803. Whittier and Wordsworth have embalmed the name of Toussaint L'Ouverture in their poems. Wendell Phillips made him the theme of an oration.

Tow'er, Charlemagne, an American diplomat, was born at Philadelphia on April 17, 1848. He graduated from Harvard University (1872), spent four years in Europe, and in 1878 was admitted to the bar. He became active in business affairs, including railroad interests and mining, for some years; but in 1891 he began to devote himself exclusively to history and archæology, and became a professor in the University of Pennsylvania. He was appointed United States minister to Austria-Hungary in 1897, ambassador to Russia in 1899, and ambassador to Germany in 1902, retiring in 1908. He has published *The Marquis de La Fayette in the American Revolution* and *A Catalog of a Collection of American Colonial Laws.*

Tower of Lon'don, a famous ancient citadel erected by William the Conqueror about 1078 to dominate the city. It is in the oldest part of the British metropolis, on the north bank of the Thames, about a mile below London Bridge. It is surmounted by a keep, known locally as the White Tower, — the council chamber of the early kings. The Tower is historically notable for the many distinguished persons — traitors and others — who have been confined within its walls as prisoners of state or have met death on the scaffold or at the headsman's block on the adjoining Tower Hill. In modern days it has become the repository of the national arms; and since the restoration the *regalia* or crown-jewels have been kept in the Tower on exhibition.

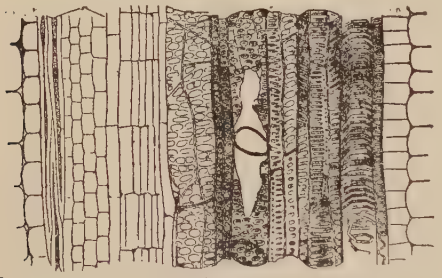
Towhee or **Cheewink,** member of the finch family. The bird is smaller than the robin, the color of its sides a rich, reddish chestnut, below white, upper part black, tail tipped with white. The call-notes give it its names; its song, simple and pleasing, is heard from among the branches. Favorite haunts are thicket and scrubby wood. It forages on the ground, is expert in unearthing wire-worms, beetles and larvæ, and has special liking for hairy caterpillars and potato-bugs. It nests on the ground, the nest seeming a very part of the soil, the eggs white marked with dull brown, in number four or five. The birds migrate in April, September and October, the breeding-range extending from the lower Mississippi valley and Georgia northward to Maine, Ontario and Manitoba. It sometimes is called ground-robin.

TOWHEE

Town-Meet'ings are held annually in the New England towns for general discussion, the election of officials and the voting of taxes. A town in New England does not necessarily mean a small city; but, rather, a unit for the administration of local government, often mainly rural. The township system is much more important in New England than elsewhere. It dates from the days of independent, local governments by the Pilgrim Fathers and the Puritans, when the town was essentially the church, and the church was almost the state. The New England town-church was intensely democratic. Thus the town-meeting as still practiced in New England affords the most perfect example of a completely democratic government. All the legal voters of the town may appear, and discharge the duties of government, as in some of the Swiss cantons, not through their representatives but in person. The colonial legislatures left the townships to govern themselves almost without interference, except where the colonial laws might happen to be transgressed. Town-

meetings were at one time held about once a month; and even now special meetings in addition to the annual meeting are occasionally held. But the usual type of town-meeting is that which meets annually, elects a committee of selectmen and such officials as the town-clerk, the tax-assessors, the treasurer, the school-trustees and the overseers of the poor. The officials so named may themselves constitute the board of selection. The New England town-meetings resemble the Old-English town-moot; but seem not to have been direct imitations of it.

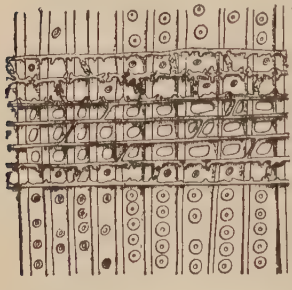
Trachea (*trā'kē-ȧ*) (in plants), the characteristic element of wood or xylem, the tracheæ together constituting the tracheary tissue. A trachea is a vessel composed of a single, elongated cell or of several cells set end to end. The cells usually are of large caliber, with very heavy walls, which are variously thickened. In some cases the thickening consists of a spiral band, in others of distinct, encircling rings. Frequently the thickening of the walls leaves definite, thin spots, called dots or pits. In this way the spiral, annular and dotted ducts or vessels are formed. The tracheary tissue is chiefly concerned in the conduction of water from the roots to the leaves;



Vertical section of stem from the epidermis (at the left) to the pith (at the right), the vessels or tracheæ being recognized by their large size and by their pits and spirals.

and frequently it is an important or even the chief mechanical support of the body.

Tracheid (*tra'kē-ĭd*) (in plants), a single cell with all the wall features of a trachea, but not uniting with others to form a vessel. It is more or less elongated and taper-pointed like a fiber. Tracheids form the characteristic soft and straight-grained wood of pines and other conifers. In these forms, as in all gymnosperms, the walls of the tracheids contain bordered pits, that is, pits which appear to have a double border about them. This type of pit is a constant feature in gymnosperms, so that the group may be recognized even by a single wood-fiber.



Vertical section of pine wood, showing the pitted tracheids crossed by a pith ray.

Track-Events are sports practiced on a circular path. They comprise running and hurdling. Running includes sprinting for 50, 100 or 440 yards and runs of ½, 1 and 2 miles. Hurdling is sprinting for 120 or 220 yards and leaping 10 hurdles, those of the longer course being 2½ feet in height, those of the shorter course a foot higher. The hurdles of the long course are 20 yards apart, but on the short course the first hurdle stands 15 yards from the start, the next eight are ten yards apart, but the tenth is 15 yards away. Hurdling demands judgment and skill as well as strength and speed.

Trade-Mark, the name or device used to distinguish the merchandise of a firm from that of others. Trade-marks are protected by law in nearly all countries, in order to protect buyers from frauds and enable a merchant or manufacturer to profit by the superiority of his goods. In the United States a merchant or firm registers its trade-mark in the patent-office (*q. v.*), and is entitled to its use for 30 years and to renew it for 30 years more.

Trade-Routes. Many of the trade-routes of the world have been discussed under CARAVANS and OCEAN-ROUTES; and it will here suffice to describe the chief trade-routes leading from America and Great Britain. In ancient times the chief trade-routes were overland; at present they are over sea. From the days of the ancient Phœnician traders to the 15th century the only important sea-routes were the coastal routes of the Mediterranean and Atlantic. But Vasco da Gama's discovery of a way to India around the Cape of Good Hope in 1497 and that of a supposed route to Asia by Columbus in 1492, followed as they were by a host of similar explorations, opened great oceanic highways. The chief of these routes were those to the West Indies and South America, to India around the Cape of Good Hope, to the East Indies *via* India and to the Pacific through the straits discovered by Magellan in 1520. By the discovery of these routes a change was made in the focus of commerce from the Mediterranean cities to those of western Europe. The great trade-routes of the ancients led to and from such cities as Tyre, Sidon, Ephesus, Carthage and Rome, and those of the middle ages were focussed at Venice and Genoa, all being Mediterranean ports.

Spain and Portugal took the lead in the trade of the 15th and 16th centuries; but were soon eclipsed by Holland and England. The greatness of the trade of France, America and Germany is of later develop-

ment, although as early as the beginning of the 18th century France was a formidable rival of England in America and the Indies.

The trade-routes of the United States may be mentioned in connection with the chief cities. Portland (Maine) in New England has a shipping-trade with Canada during the winter, when the St. Lawrence is frozen. From Boston, Mass., vessels trade mainly with Europe; but also to all parts of the world, even to Australia for wool. Boston also is a terminus of an overland trade-route by rail with the west, whence come grain, meat and raw materials for manufacture. In the Middle Atlantic States New York is a center of trade-routes to all parts of the world. Produce from the western states is conveyed here by rail for exportation. Philadelphia is a great shipping-port for coal to the southern states and New England; and also has a large canal and railroad trade. The shipping-routes from Norfolk to New England and England are due largely to the cotton-trade. In the south New Orleans is the terminus of trade-routes to the Mediterranean, England and France. The rich produce of the Mississippi Valley and the cotton of the extreme south form the staple of its trade. The chief trade-routes between the United States and Canada are across the great lakes, *via* Chicago and *via* Buffalo to Montreal. The leading trade-routes from the Pacific Coast are to Japan, to China, to the Philippines, to Australia and to the eastern coast of South America. The Panama Canal, when completed, will open a new route not only from America but from Europe to the Pacific.

Britain is the principal center of the trade-routes of the world, especially through the ports of London, Liverpool, Glasgow and Belfast. The *Atlantic route* from British ports runs directly to New York, Boston, Philadelphia, Baltimore, Norfolk, Charleston and New Orleans. These ports are reached without the need of an intermediate coaling-station. The *Cape route* is to South Africa and Australia the Cape of Good Hope. The *Suez route* passes through Suez Canal; and commands the trade of southern Asia, the East Indies and, partly, Australia. The ports along this route, most of which are fortresses, include Gibraltar, Malta, Aden, Perim, Singapore and Hongkong. The *Plata route*, which takes its name from Plata River, leads to Brazil and Buenos Ayres. A few vessels still go round Cape Horn to Australia by this route. The *West Indian route* leads to the West Indies and Mexico; and with the completion of the Panama Canal will no doubt be extended to the Pacific Coast and Polynesia.

Trade-Schools. Under modern conditions of industry the old-time period of apprenticeship to a trade or handicraft is being supplanted by a course in a trade-school. The object in trade-schools is to give the pupil in the shortest possible time such a knowledge of the underlying principles of a particular trade and such practice in the use of its tools, that he will be able immediately after graduation to do competent work and earn good wages.

New York Trade-School was the first institution of its kind in the United States, having been founded in 1881. Its courses include bricklaying, plumbing, plastering, house-painting, steam-fitting, electrical work, blacksmithing, sign-painting, fresco-painting, steel and other metal work and drawing. Both day and night classes are conducted, and the tuition fees are merely nominal.

Several trade-schools have been endowed by private persons, sometimes with the object of enabling poor boys to learn a trade, sometimes to furnish skilled tradesmen from our own nation instead of being under the necessity of importing them from abroad. Few trade-schools have yet received state aid.

A number of large manufacturing establishments, as Hoe and Co., printing-press manufacturers of New York City, have devised a scheme of apprenticeship whereby their young men are enabled to become all-round mechanics rather than masters of only one small process. Evening classes are utilized to this end, in which instruction is given in mathematics, mechanics and drawing.

Some of the principal trade-schools in the United States are New York Trade School; School of the Philadelphia Builders' Exchange; Williamson Free School of Mechanical Trades, Philadelphia; Pratt Institute, Brooklyn, N. Y.; Waltham Horological School, Waltham, Mass.; Elgin Horological School, Elgin, Ill.; Ohio Mechanics' Institute, Cincinnati, O.; and Lowell Institute of Practical Design, Boston.

Trade-Winds are winds of the intertropical zone and of a region on each side of it for a short distance which blow from the same quarter all the year through, unless they are affected by local causes. North of the equator their general direction is from northeast to southwest, but south of it they blow from southeast to northwest. In some places they blow in one direction for half the year, but in the opposite direction for the other half. They are caused by the earth's rotation and the air's movement from the poles to the equator. The hot air rises, the cold air comes in its place, and the earth's rotation changes the direction of this from due south to southeast or from due north to northeast. It is only over the open ocean that they are continuous. The larger the ocean, the steadier the trade-winds. Hence, those of the Pacific blow more regularly and strongly than those of the Atlantic. They are

separated by a belt of calms (*q. v.*) or of variable weather. Their name comes from tread, which sailors pronounced trade, because they tread so steadily. But it also is said that they are named because of their usefulness to marine trade.

Trade-Unions. A trade-union may be defined as a continuous association of wage-earners, primarily for improving conditions of employment, secondarily for any form of mutual benefit and protection. In the strictest sense it is a combination of wage-earners engaged in the same industry or the same trade. Thus the carpenters' union is of men engaged in the same trade; the United Mine-Workers' Union is of men engaged in the same industry, though of several trades; miners proper, as well as blacksmiths, firemen, etc. The Knights of Labor, on the other hand, was not a trade-union at all, as it included men who were not wage-earners; in fact, any one over 16 might join, provided he sympathized with the purposes of the order.

Trade-unions are distinct from trade-guilds of the middle ages and the succeeding centuries so far as the latter consisted either of masters or of men who, in the normal course of affairs, would become masters. The trade-union proper came into existence only when there was created a sharp distinction between wage-earners as a class and employers as a class, a distinction that arose only with the rise of methods in production that require considerable capital. Thus a man with much capital sets up a shop in which he employs many men, paying them by the day or week and discharging them when he has no further use for them. In certain lines of business, as tailoring, these shops soon drive out of business the shops where there is but one man or a few partners, with a few apprentices to assist. This innovation spread in England, about the beginning of the 18th century. At once the employees in such capitalistic shops found that, unless they combined and *bargained collectively*, they were liable to a heartless and unbridled tyranny which had been impossible under the old conditions of working; for the employer obviously has a great advantage over the individual employee, which prevents the latter making with the former a free contract in any proper sense of the term. Thus the earliest trade-unions, those of the journeymen-tailors in London and the woolworkers in other parts of England, sprang into being. The laws of England forbade such combinations; but those laws also forbade the employers to pay less than a certain wage, which was regarded as sufficient for decent and healthy living. Between 1756 and 1814, in the desire to secure foreign trade at any cost, the laws controlling wages fell into disuse and were then repealed, while the laws forbidding combinations in restraint of trade were made more rigid and were enforced with great severity against the workmen, but not against the employers. But, working steadily for the good of the men and of humanity generally, Francis Place, whose name should be remembered, though himself an employer, in 1825 secured from Parliament a repeal of the anticombination laws. In 1871 trade-unions received from Parliament full recognition.

In the United States employers and employees started without any definite restriction on combination, though the English law on the subject had some weight on the attitude of the courts. In 1821 Pennsylvania definitely declared trade-unions to be legal; but not till 1843 did Massachusetts follow suit. But the law against labor combinations has never been recognized as binding on the courts of this country. The earliest trade-unions of this country arose in New York City. They were the unions of journeymen-shipwrights (1803), of house-carpenters (1806) and of the famous N. Y. Typographical Society. Since that time the movement has developed on parallel lines in England and in the United States, conditions compelling the English labor-unions to advance somewhat more rapidly.

Between 1825 and 1880 in England and between 1810 and 1880 in the United States the trade-unions as a whole had not learnt the principle of federating the lesser branches into a central organization. The separate unions frequently indulged in useless strikes, foredoomed to failure. The central organizations that came into being from time to time turned to co-operative schemes or to political movements for which the countries were not prepared, usually of a socialistic character. There was no little corruption as well as folly among the leaders. The unions were largely restricted to the stronger trades and to favored localities. Among the noteworthy advances at this time, however, we may note the first provision for a joint conference of employers and employees (1860) held in Great Britain, in connection with the hosiery trade; the formation of some strong national unions, as the typographical union and the national associations of hat-finishers and of locomotive-engineers in the United States; and the adoption of the union label as a sign that the work so stamped has been done under the conditions of payment and employment for which the union stands. The Knights of Labor, established in the United States in 1869, had great success for fifteen years, but have given way to the American Federation of Labor. The Trades-Union Congress, established in Great Britain in 1868, was at first prevented from attaining its present importance because of the restricted character of its membership.

The "new unionism" may be said to date from the year 1880 both in Great Britain and in this country. In Great Britain it was then recognized that unskilled labor should be admitted to the Trades-Union Congress and that missionary work to organize those trades was essential. In 1888 and 1889 the result was shown in two historical strikes in which the employees, enjoying the sympathy of the whole laboring world and of the public generally, won great victories; viz., the strike of the match-girls and that of the dock-laborers in London. As a result, the leaders of these strikes, John Burns and Tom Mann, secured control of the Trades-Union Congress, with many remarkable results. Of these may be mentioned the commencement of political activity, under favorable conditions, culminating in the formation of a labor-party, which may throw its strength to the side of any one of the great political parties which supports labor-policies; the General Federation of Trade-Unions, which in 1902 had a membership of 419,600 and in 1905 2,000,000 members; and the encouragement of municipal ownership, which has made great strides in England. To-day the Federation enjoys great prosperity and is responsible for many excellent laws passed by Parliament for the betterment of the laborer. It is especially to be noted, however, that the English unions insist on keeping the Labor-Representation Committee distinct from the Trades-Union Congress and from the Federation of Trade-Unions, believing that thereby the cause of labor is kept free from political animosities, while their political activity is less closely associated with the socialistic trend of trade-unionism. This policy has had its fruit in the promotion of John Burns to a cabinet position.

In the United States the new unionism was foreshadowed by the formation of the American Federation of Labor, the most important of our labor-organizations. It was not till 1895 that this society awoke to the realization of its possibilities, especially in the organization of unskilled and poorly paid labor. It may be said to have attained its majority at the time of the great coal-strike of 1902–3. In that strike the United Mine-Workers, under John Mitchell, successfully faced one of the largest combinations of capital that exists, the group of mine-owners and railroads that practically control the coal-product of the nation. Labor here showed its solidarity, and had the sympathy of the very people who suffered most from the strike. Between 1890 and 1900 the American Federation of labor increased from about 200,000 to about 550,000, the increase coming between 1895 and 1900. In the next two years it increased to over one million, and now probably includes three millions among the members of its constituent and affiliated associations in the Uaited States and Canada.

Another great federation of labor in this country was the American Labor-Union, organized as the Western Labor-Union in 1898 and changing its title in 1902. This organization is now known as the Western Federation of Miners. It is very influential in the mining states of the west and is affiliated with the American Federation of Labor.

While trade-unions were legalized many years ago in all the states and by the Federal government, and while 15 states have even forbidden employers to exclude a man from employment because of his place in a union, and though cities have required their work to be done by union labor, yet the following dangers still threaten the labor movement: It is a question whether unions do not constitute a combination for the restraint of interstate commerce in the same sense that many trusts do. Again, the boycott, which is a weapon the unions often use, has been adjudged unlawful by some courts, lawful by others. But certain acts which amount to a boycott,—as agreeing to use only goods marked by the union-label and the sending of notices to the effect that a certain house is unfair,—*i. e.*, does not meet the demands of the union,—have been judged lawful. Congress as well as the great majority of the states of the Union has passed a law to permit trade-unions to incorporate; but, as this would make them liable to be sued by employers, they have seldom availed themselves of the privilege.

Arbitration, which involves calling in a third party, is not favored by trade-unions, except as a last resort; but they have, in cases of difficulty, been found much more willing to submit their cases to arbitration than have the employers. Compulsory arbitration is opposed, as it is felt that it would stand in the way where the union is fighting to establish a new principle, a forward step in the conditions of labor. In 1916, at the threat of a general railroad strike, Congress passed a law compelling the roads to make an eight-hour day the basis of pay. This action was criticized as destroying the principal of arbitration.

Of foreign countries, other than Great Britain—New Zealand, Australia and Switzerland have been foremost in establishing compulsory arbitration. In New Zealand there is a board of conciliation, which first attempts to straighten out any dispute that may arise. Either party to the dispute, however, may appeal to the board of compulsory arbitration which consists of one employer, one employee and a justice of the supreme court. Its awards are enforced by penalties. Consult Sidney Webb's *History of Trade Unionism;* R. T. Ely's *The Labor Movement in America;* the Industrial Commission's *Report*, Feb., 1902, especially volume 17; and *Reports* of the Bureau of Labor. See SYNDICALISM.

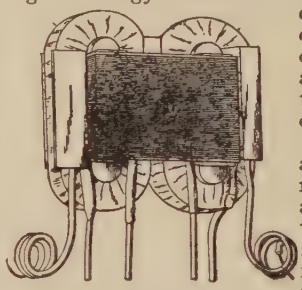
Trade Commission. See FEDERAL TRADE COMMISSIONS.

Trafalgar (*trăf'al-gär'*), **Cape,** on the southern coast of Spain, is celebrated for the great naval battle gained off its shores, Oct. 21, 1805, by the British fleet under Nelson (*q. v.*) over the combined fleets of France and Spain. The British had 27 sail-of-the-line and 4 frigates, the French and Spaniards 33 sail-of-the-line and five frigates The British captured 19 of the enemies' ships. Nelson was killed but was told of the victory before he died. As Nelson bore down on the French, he hoisted the famous signal: "England expects every man to do his duty." In a storm that night all but four of the prizes were lost or destroyed, a disaster which would not have happened had the dying admiral's order to anchor been obeyed.

Traill, Henry Duff, D. C. L., an English man-of-letters and editor of *Literature*, was born at Blackheath, London, Aug. 14, 1842, and died at London, Feb. 21, 1900. He was educated at Merchant Tailors' School, London, and at St. John's College, Oxford, and joined the staffs of the *Pall Mall Gazette* (1873), the *Saturday Review* (1883) and *The Observer* (1889), and afterwards became editor of *Social England* and of *Literature*. His writings (besides *Lives* of Sir John Franklin, Lord Cromer and Lord Salisbury) include *Central Government; William III* in the Twelve English Statesmen Series; *Strafford* in the English Men of Action Series; *Sterne* and *Coleridge* in the English Men of Letters Series; *Shaftesbury* in the English Worthies Series; *The New Lucian; Saturday Songs;* and *The New Fiction and other Essays on Literary Subjects.*

Tra'jan, Marcus Ulpius, Roman emperor, was born at Italica, near Seville, Spain, on Sept. 18 in 52 A. D. He was a successful commander in the wars against the Parthians and Germans under Titus and Domitian. In 91 his prestige gained him the consulship, and six years later Nerva adopted him as his fellow-ruler and successor. In 98 he became emperor, and celebrated the event by the gift of large sums to the soldiers and to the citizens and their children. He also had the state pay the expenses of bringing up the children of poor freemen in Rome and other Italian cities. In 101 Rome for the first time saw its emperor leading forth his legions in person, when Trajan set out on his first campaign against the Dacians. The conquest of the brave people, who had been paid tribute by the Romans since Domitian's reign, was not finished till 105. After going back to Rome to celebrate this conquest, the first since the time of Augustus, he started to wage war in the east. Armenia, Parthia, Mesopotamia and northern Syria and Arabia were conquered or reconquered, and Trajan was the first Roman general to sail down the Persian Gulf. Trajan's government was of the best. Under his rule the laws were carried out with justice, and the governors were held to strict account. Military roads, canals, bridges and towns were built. Trajan's wall, a line of earthworks from the Danube to the Black Sea, was raised, and Rome was beautified; among the improvements were Trajan's forum and the famous Trajan's column, whose bas-reliefs still tell the story of his military achievements. He died in August, 117 A. D.

Transform'er, an apparatus for converting the energy of an electric current into the energy of a secondary electric current. There are two kinds of transformers in commercial use: the static or alternating current transformer and the rotary transformer. The A. C. transformer converts a primary A. C. into a secondary A. C., but so that the product of the current and pressure or potential (ampères x volts) of the primary current is practically equal to the corresponding product of the secondary current. Thus, an ordinary electric-lighting transformer transforms one ampère at 1,000 volts into ten ampères at 100 volts etc. This is a "step-down" transformer. In a "step-up" transformer the voltage or pressure of the secondary current is higher than that of the primary current. Transformers are used on account of economy of distribution of electric energy. It requires a much smaller wire to transmit a given amount of electrical energy economically at 1,000 volts pressure than to transmit the same amount of energy at 100 volts. But the higher voltage cannot be well and safely used for many purposes, as for incandescent lamps. So the current is transmitted on the main wires at the higher pressure and transformed down to the lower pressure by an A. C. transformer just before passing into the house where it is to be used. Previous to 1883 practically all the electric lighting from central stations was done by direct current, but the successful application of the A. C. transformer by Gaulard and Gibbs, Stanley and others so reduced the cost of the transmission lines, that within a few years practically all the central-station incandescent lighting was done by the A. C. systems. The A. C. transformer is simply a form of the induction-coil (*q. v.*) but has an alternating current in the primary coil instead of a make-and-break device. It consists of two separate coils of insulated wire, having a laminated-iron core common



COILS AND CORE OF AN A. C. TRANSFORMER

to both coils. The primary A. C. current is sent through one coil, and this induces a secondary current in the other coil and its circuit. The ratio of conversion is that of the number of turns on the two coils. Thus, to transform from 1,000 volts to 100 volts (a ratio of ten to one), the primary coil has ten turns for every one turn on the secondary coil. Step-up transformers are used on long-distance electric-power lines. Thus, in a Californian transmission-line, the generators can safely generate currents at only 5,000 volts, and 60,000 volts are used on the lines. Here a step-up transformer is used at the dynamo having the conversion ratio of one to twelve, and proper step-down transformers are used at the other end of the line to reduce the voltage for power and lighting applications. The efficiency of the A. C. transformers depends on the quality of the iron in the core and upon the proper proportioning of the parts. In good commercial transformers an efficiency of 98 to 99 per cent. on full load is commonly attained.

In a rotary transformer an alternating current is transformed into a direct current or *vice versa*. A rotary transformer is a form of dynamo-machine having field-magnets and armature similar to an A. C. dynamo, but having a D. C. commutator on end of armature shaft and A. C. collector-rings on the other end. Such a machine is used in central electric-plants where it is desired to generate and transmit A. C., but it is necessary to use D. C. for street-car motors or for electro-chemical processes. See INDUCTION-COIL. A. P. CARMAN.

Trans-Isthmian Canal. See NICARAGUA CANAL and PANAMA CANAL.

Trans'it, in astronomy, means the passage of a planet across the disk of the sun or of a satellite across the disk of its primary, that is, the planet about which it revolves. Mercury and Venus have orbits which lie within the orbit of the earth, and so their transit can be observed. The transits of Venus are of great importance, as they are one of the means used to determine the sun's distance. Other methods had been tried without giving accurate results, until Halley in 1716 proposed a method of employing the transits of Venus. Accordingly, the transits of 1761 and 1769 were observed in various places, and in 1842 Encke from these observations reached a generally accepted result. A transit can take place only when the planet is in a line between the earth and the sun. There always are two transits of Venus eight years apart, and then a lapse of 105 or 122 years, when another pair of transits occurs, with eight years between them. The transit of 1874 was followed by that of 1882, but there will not be another until 2004. Mercury is nearer the sun, thus having a shorter orbit and year and therefore more frequent transits.

Trans'it-Instrument, an especially improved and refined telescope, mounted at right angles to a horizontal axis on which it revolves, and used at observatories and meteorological stations for observing transits or the passing of a heavenly body between the observer and another more distant body of larger apparent surface in the heavens. It is used in connection with a clock for noting the time of transit at a given meridian.

Transkei (*trăns'kī'*), is a part of Cape Colony, lying on the coast just south and west of Tembuland. It has an area of 2,552 square miles and a population of 177,730, of whom 1,707 are whites.

Transmis'sion of Pow'er, a branch of mechanical engineering treating of the means of transmitting power from a point where it is generated to the point where it is to be used. For short distances, as in a machine-shop, shafting and belting are commonly used. For longer distances four systems have been used: the wire-rope, pneumatic, hydraulic and electric systems. The above division does not include the indirect method of carrying gas to the point where it is to be used, in a gas-engine or otherwise, nor the method of carrying live steam to considerable distances from the boiler, a method which is only resorted to in extreme cases. The question of transmitting energy not only is one of engineering possibility, but involves economical questions. Some of the questions that have to be considered are the losses along the line of transmission due to friction (mechanical or electrical) or other causes; the deterioration of the installation; interest on the investment; the cost of attendance; the number of horse-power to be transmitted; the number of hours in the year of full load; the cost of power at the two ends of the line; besides questions of convenience etc.

In wire-rope transmission the power is transmitted by a wire-cable carried over pulleys between the two stations. It is used in street-car systems (see CABLE-ROADS), manufactories, mines etc., and for distances up to three miles is commercially efficient, provided the load is large and continuous. Beyond that the efficiency decreases very rapidly, owing to the cost of installation and the dead weight of cable to be carried. In hydraulic transmission water is carried under pressure in pipes or conduits, and hydraulic motors of some form used. The losses in the pipes are decreased by decreasing the velocity of flow and increasing the pressure, but these conditions require large and strong pipes, items adding to the cost of installation and therefore to the interest-charges. The efficiency of hydraulic transmission is always low, 50 per cent. or less, but it is well-adapted for short distances where great forces are required as in lifting large loads and exert-

ing great pressures. In pneumatic transmission the power is transmitted by compressed air in pipes to pneumatic engines and tools. It is a system used largely in mining where pneumatic drills are used, and within a few years its use in connection with many machine-tools has greatly extended. Pneumatic tools, as riveting-machines, drills, presses etc. usually are very convenient in operation, and although the mechanical efficiency of the whole system is low, owing to the thermal losses in compressing the air, the use of pnuematic transmission for short distances is increasing, owing to convenience of operation, flexibility and portability of tools. In mining and tunneling it has the great additional advantage of furnishing necessary ventilation along with power. For efficiency, flexibility, economy of operation and cost of operation no system of power-transmission can compete with electrical transmission for longer distances. For longer distances, as 25 to 100 miles, it is the only system by which power-transmission is possible, and even for short distances, as in machine-shops, it is competing with belts and shafts. Many shops and factories are to-day putting in motors for each machine, and thus doing away with belts and shafting. Long distance power-transmission by electricity is the most notable engineering achievement of recent years. It began in the experimental plant of Marcel Deprez at the Munich Exposition of 1882. The line was from Miesbach to Munich, a distance of 37 miles, the power transmitted was ½ H. P., and the pressure was 1,350 yolts. The dynamos and generators were similar Gramme machines. This plant was of small magnitude, but it established the possibility of long-distance transmission. During the next few years power-transmission was developed largely in the way of stationary motors operated on central-station lines and especially in electric railways. (See ELECTRIC RAILWAYS.) Economical transmission of electric energy for long distances requires high voltages, and high voltages cannot be handled easily except in alternating-current apparatus (see TRANSFORMER), so that long-distance transmission was not fully developed until the invention of the successful A. C. motor, the polyphase induction-motor. (See ELECTRIC MOTOR.) In 1891 an experimental line from Lauffen to Frankfort-on-the-Main was shown at the Frankfort Electrical Exhibition, in which over 100 H. P. was efficiently transmitted 110 miles at 20,000 volts by the use of three-phase A. C. apparatus. Since then numbers of large commercial plants have been installed, transmitting thousands of H. P. from three to 35 miles. The Fresno, Cal., Folsom-Sacramento and Niagara Falls plants probably are as notable as any of these plants; but the plants at Lachine Rapids, Montreal, at Portland, Ore., of the Standard Electric Company of California and several plants in Switzerland and Italy are equally interesting to the engineer. In the Fresno plant 1,000 H. P. is transmitted 35 miles by a three-phase system from a water-plant in the Sierras to Fresno. Sacramento, Cal., is supplied by a similar system, with about 4,000 H. P. from the falls at Folsom, 23 miles away. At Niagara Falls 50,000 H. P. is generated by ten dynamos, run by turbines, and the power is distributed as far as Buffalo, 27 miles away. The Standard Electric Company's lines bring electric power into San Francisco and San José from a point in the Sierra Nevada. The electric cars and lighting of San José are supplied by electric currents generated 83 miles away. All these long-distance lines have been built to transmit the power from water-power, but it is one of the plans of the future to establish generating-plants at the mouth of coal-mines and transmit the power instead of the coal to cities within a radius of from two or three hundred miles. See NIAGARA FALLS CITY and NIAGARA POWER-PLANT. A. P. CARMAN.

Tran'spira'tion (in plants), the loss of water by evaporation from a plant. Since 50 to 98 per cent. of the plant-body is water, it loses water whenever the air contains less moisture in proportion to its capacity than the plant. Transpiration therefore is unavoidable under the conditions of most land-plants. To reduce this unavoidable loss, the larger land-plants make the outer tissues of the aërial parts nearly waterproof. But the air-passages (see AËRATION) permit evaporation from the cells bounding them; hence the moisture diffuses through the stomata (*q. v.*) to the outer air. Were evaporation prevented by waterproofing these cells also, the absorption of gases for food-making and respiration would be nearly impossible. The amount of transpiration varies greatly in different plants according to their structure and contents; in the same plant it varies with age and the varying external conditions, as temperature, light, moisture etc. Therefore, only a very general idea can be given of the amount of water transpired. On a hot summer-day a plant with five square meters (about six square yards) of foliage (such as a thrifty sunflower as high as a man might have) will evaporate about 1.2 liters (2.5 pints) of water. A birch 40 feet high, with perhaps 200,000 leaves, will give off on a hot day 300 to 400 liters of water (about 2.5 barrels). But these rates would not be kept up as an average through the growing-season. The evaporation from a leaf-surface is 2 to 7 times less than that from an equal area of water.

Transplant'ing, a horticultural process, the transference of plants, as trees, from a nursery or from their native habitat or of

young flowers and garden-vegetables to take advantage of the start given them under protection. Tree-seedlings should not be transplanted till the spring following the planting of the seeds. Young trees three or more years old are best transplanted in the autumn when the leaves are falling. Fall-planting enables the small root-fibers to make a start before spring and permits the trees to be cultivated early. The roots should be pruned to leave no ragged wounds. Young trees with a taproot should have it cut to one third its length at the first transplanting. This promotes thrift and makes any subsequent transplanting easier. As about half of a young tree's roots are injured in transplanting, that much or a larger proportion of the top should be cut back. Large trees must be transplanted to soil of the same character as that in which they have been growing. A hole for a large tree, dug in stiff clay, is apt to become a drainage-sink for surface-water, in which the roots are flooded and deprived of air. (See DRAINAGE.) The bottom of the hole should not be concave, deepest in the center, but dome-shaped, deepest at the edge, with a couple of deep post-augur holes for drainage. This shape of bottom conforms to the spreading habit of the roots.

Garden-vegetables are started indoors or in hotbeds (*q. v.*) and are transplanted to give them the greatest advantage of the growing season and to bring the best early-market prices. The seeds are planted in fine, rich earth, usually in shallow trays or pots, and transplanted at various degrees of growth. The treatment of a few common and typical vegetables involving transplanting is given below. Cabbage: The seeds for the early crop are started under glass 30 or 40 days before the ground is fit. Plants from three to five inches high may be transplanted, if properly hardened, to the permanent patch, in middle latitudes, as early as May first. Celery: Seeds are sown under glass in February; small plants are transplanted for thinning out when large enough to handle, when the taproot is destroyed; they are transplanted a second time when well-established. In the final transplanting the plants are set in trenches or on the ground, and are covered. Lettuce comes up very thick, and, if sprouted indoors, may be transplanted when large enough to handle. Tomato: Seeds are started eight or ten weeks before setting out of doors, and are transplanted two or three times, using larger pots each time and giving a light dressing of nitrate of soda or of liquid manure. Sweet potato: The tubers are laid three or four inches deep in a hotbed three or four weeks before frost is over. The sprouts are broken from the tuber when four or five inches long and well-rooted, and are transplanted to the field, where they will form vines. Their tips, if cut off six to nine inches long, can also be planted to form other vines. On a small scale the above mentioned and other seeds can be sprouted in window-boxes indoors, but must not be subjected to too great extremes of temperature. See HOTBED.

Trans-Sibe'rian Railway. See SIBERIAN RAILROAD.

Transvaal (*trăns-väl'*), formerly the South African Republic (1833-1902), is a British possession in Africa. It lies between Vaal River and Limpopo River and is bounded by Matabeleland (Rhodesia) at the north; Portuguese East Africa and Natal on the east; the Orange Colony to the south; and Bechuanaland on the west from Orange River to Southern Rhodesia. Swaziland was a protectorate of the former republic, which had an area of 119,139 square miles, but the transfer of the Vryheid and Utrecht districts; of Swaziland; and of part of the Wakkerstroom district to Natal reduced the area to 111,196 square miles. So Transvaal is of quite the same size as Arizona.

Surface and Climate. The land consists mainly of a plateau 3,500 to 5,000 feet above the sea. Lying in the same latitude south as Florida lies north, it has a semitropical climate, which, however, is dry and admirably adapted for settlers from temperate climes. The plateau is bounded eastward by mountains rising 8,275 feet that shut off the winds of the Indian Ocean, while deserts west of Transvaal dry the winds from the Atlantic. It is crossed in the north by the Zand Mountains and in the south by the Witwatersrand (Whitewater Ridge). Its chief rivers are the Vaal and Limpopo, and it has some large lakes. Both the mountains and the plateau are exceptionally rich in coal, cobalt, copper, diamonds, gold, lead, saltpeter, sulphur and tin. The soil, if irrigated, would be well-suited to agriculture, but the rainfall is deficient; and the forests, chiefly acacias, are only of slight extent.

People and Government. The country was first occupied in 1833-7 by Boers from Cape Colony, among them a boy destined to become famous as President Kruger, who named their land Transvaal because it is across beyond Vaal River. In 1856 they became a republic, but factional troubles, unwise administration and wars with the natives led to annexation by Great Britain in 1877. In 1881, in consequence of fighting against England, the republic regained independence, subject, however, to British control over its foreign affairs. The discovery of the Witwatersrand goldfields (1885) attracted great numbers of foreigners, chiefly British, and finally occasioned annexation again to Britain in 1900. (See BOER WAR.) The population is 1,676,611 (that of Swaziland being 99,959), of whom

over 300,000 are whites. Only 100,000 of these are Boers, and their chief occupation is stock-rearing, agriculture being only slightly practised. The government is administered by a governor, who appoints a cabinet, and by a legislature consisting of a council and an assembly. The legislature meets annually, but the governor may prorogue or dissolve it, and it can not continue more than five years. Botha, the famous Boer general, is premier, and three other Boers hold cabinet-offices, non-Boers having only two. The government departments include agriculture, lands and native affairs, mines, public works, the secretaryship and the treasury, the minister of mines being the attorney-general also and the minister of agriculture the premier. Pretoria, with a white population of 29,660, is the capital. Johannesburg, the mining center of Witwatersrand, is the metropolis of Transvaal and the fourth city of Africa, having a white population of 120,411. (The high commissioner for South Africa administers Swaziland, but the laws of Transvaal rule it. Only 890 of the people are whites.)

Education and Religion. Education is progressing rapidly, being free wherever an average attendance of 30 children can be had. Out of 258,826 whites in 1904, who were at least five years old, 227,100 could both read and write. In 1911 there were six high schools with 2,081 pupils, 526 country schools teaching 18,858 children, 137 town-schools with 31,131 pupils, 12 colored schools with 1,654 scholars, and 190 native schools with 13,365 pupils. Pretoria has a normal college, Johannesburg a technical institute of engineering and mining. The Dutch Reformed Churches claim 147,319 members; the English Church 68,390; Methodists number 38,152; Jews 15,481; Presbyterians 20,879; Roman Catholics 16,481; Lutherans 64,257; other Christians 24,008; and Brahmans and Buddhists 11,440. The *white* members of the Dutch churches number 143,015; of the Anglican church 55,094; of the Presbyterians 18,682; of the Methodists 17,206; of the Roman Catholics 14,474; of the Lutherans 5,279; and of other Christian churches 14,259. The other members of these churches are non-white. The Brahmans and Buddhists however claimed 747 white coreligionists.

Resources, Commerce, Communications. Industries are hindered by the insufficiency of the communications and particularly by the lack of unskilled labor for the mines. As the natives are not available, coolies are imported. The state's principal sources of revenue are the customs and the mines, but it is by no means self-supporting. The principal imports are provisions, machinery and clothing. The chief exports include gold (6,451,384 ounces fine in 1907), wool, cattle, hides, coal and diamonds (value in 1906 about $7,500,000). The gold-deposits are among the foremost in the world, gold-mining the supreme industry. Gold was discovered before 1875, and in 1907 about $940,000,000 had been mined. In 1907 the yield was $129,000,000. John Hays Hammond calculates that $3,500,000,000 remain to be extracted and that within 30 years nearly all the paying deposits will probably have been exhausted. The Pretoria diamond-fields rival those of Kimberley, the world's hugest diamond (*q. v.*) having been discovered in Transvaal. Nearly 2,200 miles of railway are open, about 400 are under construction, and several hundred are projected. The Transvaal and Orange railways are under joint control, and nearly $30,000,000 are to be spent on new roads. There are 2,500 miles of telegraph, communicating with inmost Africa as well as the outside world; 769 miles of telephone; 393 postoffices; and seven great banks, including the postal savings-bank. Transvaal's population should increase greatly for another decade. Even if its gold-mines become exhausted by 1935, farming, grazing, manufacturing and the remaining mineral resources ensure the permanence of population and prosperity. See BOERS and KRUGER.

Tran'sylva'nia, formerly a principality of the Austro-Hungarian empire, but since 1868 incorporated with Hungary, on the southeast of Hungary, separated from Rumania by the Transylvanian Alps, in which are found peaks 8,000 feet high. Other ranges cross the country, and divide it from Hungary proper. Gold, silver, quicksilver, copper, lead, iron, tin, coal, alum and salt, with such precious stones as garnets, agates, amethysts, carnelians and jaspers, are found. A bed of rock-salt (*q. v.*) from 60 to 80 miles wide extends through the whole country. The valleys are very fertile, and raise large crops of corn, hemp, flax and tobacco. Woolen and silk goods, paper, gunpowder, glass, soap and furniture are among the more important manufactures. The people are made up of various races, as Magyars, Saxons, Rumans, Armenians, Greeks, Jews, Bulgarians and Gypsies, the Rumans numbering about three fifths of the whole. There is a university at Klausenburg (Kolozsvár), opened in 1872. Transylvania belonged to Dacia in the time of the Roman empire, and after being overrun by Huns, Goths, Lombards and Bulgarians was finally conquered by the Hungarians in the 10th and 11th centuries. It was independent in the early part of the 16th century, but in 1713 was annexed to Austria. Area 21,512 square miles. Population 2,284,048.

Trap, a class of igneous rocks, that is, those rocks which owe their origin to fire, called *trappa*, a stair, because they break up in columnar forms, producing cliffs that

stand out in great steps on the sides of hills and mountains. They are made chiefly of feldspar and pyroxene. Trap-rocks when freshly broken usually have a green color, some being a very light green and others nearly black; the weathered surfaces are usually rusty in color. Some trap is very compact, looking like flint. Basalt is a dark, heavy variety of trap-rock. The Palisades on Hudson River just above New York City are cliffs of trap-rock.

Trap'ping is a form of the pursuit of animals which is unsportsmanlike and commercial; although it is sometimes employed abroad against lions and other beasts for self-protection. The most familiar form of trapping, perhaps, is the taking of fish. Netting fish is a form of trapping; and is done either by a gill-net into which the head of a fish enters, so that its gills are caught, or by a cast net which extends from top to bottom of the water or by a trawling-net dragged behind a moving vessel. Fish are often trapped in nooses, cages and baskets. Traps for rats and mice generally belong to the *spring*-type. Traps of this kind are sometimes cruelly armed with iron teeth; they may be used against animals of every kind. Some animals, as rabbits, may be trapped in nooses which possess a tightening slipknot. Birds are often taken by such nooses, which catch their feet and hold them prisoners. Large animals are sometimes taken by a *fall-trap*, in which a heavy weight is loosened by a touch in such a way that it crushes the animal beneath This is the principle of the *box-trap* also; but in a box-trap the animal is uninjured by the fall of the lid which imprisons him. An ancient method of trapping large animals is by means of pits loosely covered with earth. This method is laborious, but useful in the case of big game, as bears, elephants, wolves and even lions. Some animals, as deer and wild horses, may be driven down a V-shaped passage into a corral or enclosure. Trapping is an important form of the pursuit of fur-bearing beasts; since it is economical and neither injures the fur nor is apt to terrify other animals. See TRAWLING.

Trasime'nus, Lake. A shallow Italian lake lying between the towns of Cortona and Perugia, about ten miles long by eight in breadth. There was no outlet until 1896, when an artificial one was opened, draining a wide, frequently overflowed margin which has been planted in eucalyptus trees. On the farther removed slopes are olive-plantations. The lake contains three small islands. It is memorable as the scene of Hannibal's victory over the Romans under Flaminius in 217 B. C. Fifteen thousand Romans were slain, 10,000 captured, Hannibal losing only 1,500 men.

Trav'erse City, Mich., the seat of Grand Traverse County, on Grand Traverse Bay, an inlet of Lake Michigan, at the mouth of Boardman River, also on the Grand Rapids and Indiana, the Pére Marquette and the Manistee railroad, 55 miles northeast of Manistee. It is reached also by steamer from Chicago, and has steamboat connection with the chief ports on Lake Michigan. It is situated in a good farming and fruit-growing region, has a fishing-trade on the lake, and is an attractive resort in summer. The Northern Michigan Insane Asylum and State Hospital are located here. The city has 10 miles of paved streets, a $150,000 municipal water and light plant. Its trade is varied and growing, and (besides machine-shops, furniture, sash and door, basket and confectionery products) includes considerable industry in making marine engines, oval wood-dishes, shoes, floorings, interior finishings, wagons and sleighs. Settled early in the 50's, Traverse City was incorporated in 1895. Population, 14,500.

Trawl'ing, one of the many modes of catching fish, as cod, haddock, herring, soles, on the fishing-grounds off the American coast and in its bays and estuaries, as well as off the Newfoundland "banks" and off other countries of the world. In the Great Lakes of North America, as well as in deep-sea fishing, pound, gill and drift nets, seines and herring-weir, besides the hook and line, are used to trap fish, in addition to dredges, with fine-meshed nets, for obtaining oysters, scallops, clams, lobsters etc. The trawl in common use is a triangular net, purse-shaped, 60 or 70 feet in length, with a breadth at the mouth varying from 30 to 40 feet; this is fastened to a wooden beam, which keeps the net open, and is supported by two upright frames, called trawl-heads. The net, on its underside, has a deep, curved margin, attached to the ground-rope; the trawl itself having two deep pockets so adjusted that the fish, when caught, are unable to escape; while two long, stout ropes fasten the net to the trawl-heads, with a lengthy towing-line appended. The vessels engaged in trawling are generally visited periodically by swift-sailing cutters, which bring the fish, packed in ice, fresh to market. See TRAPPING.

Treas'ury, Depart'ment of. See UNITED STATES, DEPARTMENTS OF THE.

Treaty of Ports'mouth, The, which closed the war of 1904–5 between Russia and Japan, was signed at Portsmouth, N. H., on Sept. 5, 1905, by the envoys of Japan and Russia; and on Oct. 14 by the Mikado and the Czar. President Roosevelt of the United States had urged peace on the belligerents as early as June 2, 1905. As a result, negotiations for peace were begun; and on June 10 Russia agreed to receive the proposals of Japan. Plenipotentiaries were appointed to meet at Washington, D. C., but Portsmouth, N. H., was chosen

as the place of discussion. The principal articles of agreement were concluded between Aug. 8 and Aug. 31. It was agreed that Japan should have a protectorate over Korea, that Manchuria should be left to China, that Chinese territory should be safeguarded, that an "open-door" policy was to be maintained for the commerce of all nations with China and that the Liaotung peninsula should fall to Japan, with half of the island of Sakhalin. An armistice was concluded between Russia and Japan on Aug. 31; and on Oct. 16 the text of the treaty was published. Its terms were considered liberal to Russia, since she escaped an indemnity and gained railway concessions from China. See CHINA, JAPAN and RUSSIA.

Trebizond (*trĕb'ĭ-zŏnd*), a Turkish seaport on the Black Sea. It is surrounded by hills, which take in many gardens as well as the town, and is defended by forts and a citadel. There are mosques and Greek churches, copper-foundries, dye-works etc. Its large trade with eastern Europe and Central Asia makes it, next to Smyrna, the chief commercial city in Asia Minor. Trebizond was a flourishing town when Xenophon and the Ten Thousand reached it on their retreat from Persia (B. C. 401-400). After it was conquered by the Romans, it rose in importance, Trajan giving it a larger and better harbor. When the crusaders took Constantinople in 1204, Alexius I of the imperial family founded the empire of Trebizond, till then a province of the Byzantine empire. It remained independent till captured by the Turks in 1461. Population 135,000.

Tree, the climax form of vegetation. There is no line of separation between shrubs and trees, but when a woody plant rises from the ground as a single shaft which is higher than a man, there is general consent to call it a tree. Not only do ordinary trees of temperate regions continuously increase in height, but their trunks and branches increase in diameter. As a rule, during each growing-season a cylinder of new wood is laid down around the old wood. In a cross-section these successive cylinders appear as concentric rings, and by counting the rings the approximate age of a tree is obtained. This habit of adding new wood each year, which increases the conducting capacity of the stem just so much, enables the tree to increase its display of branches and foliage each year. Such a habit is found only among the gymnosperms and dicotyledons. In the former group the leaves are mostly persistent, the trees being commonly called evergreens; while the dicotyledonous trees of temperate regions are mostly deciduous. The palms are common illustrations of monocotyledonous trees, in which there is no increase in diameter, hence no branching worthy the name and no annual increase of foliage display. The tallest trees, species of the Australian genus *Eucalyptus*, do not quite reach 500 feet. The largest trunks range in girth from 80 to 100 feet, and are developed by such forms as eucalyptus the sequoia, bald cypress and the baobab-trees of Senegal. A Mexican bald cypress is on record with a girth of 112 feet. See FOREST.

Tree-Dwell'ers are native tribes of the Australasian archipelago whose houses are built upon piles. They thus are elevated from four to eight feet above the ground,

and are entered by a narrow ladder-like stairway of bamboo which may be drawn up at will. Where tribes fear attack from human enemies, their houses often are perched high in the air, either on long piles or in high trees. The dwellings of the wild Tagbannas and the Gaddanes of the Philippine Islands are of this type.. The Papuans of New Guinea have *dobbos*, houses built in high trees, their use being chiefly that of an acropolis in times of danger, but some tribes who are especially harassed by warlike neighbors appear to live entirely in them. In Sumatra a similar house is called the *balai*. The head-hunting tribes of the Solomon Islands are most deserving of the title of tree-dwellers. The inhabitants of the island of Ysabel, a favorite hunting-ground for the more northern tribes, make no attempt at armed resistance, but have built tree-dwellings and hill-fortifications. The former are quite numerous, and are used as ordinary places of residence in times of peace. Mr. W. Coote in *Wanderings South and East* describes such a house built

in a large, hardwood tree. The lower branches had been removed; the house, which was 70 to 80 feet above the ground, was very commodious and substantial, being 26 by 18 feet, with a ridge-pole ten feet above the floor. The structure was firmly fastened. Ascent was made by means of a slender, rattan ladder, swung from the house to the ground. A supply of stones was kept in the house to drive away the enemy if they should attempt to cut down the great tree.

Trench, Richard Chenevix, an Irish clergyman and writer, was born at Dublin, Sept. 9, 1807. He studied at Cambridge, and, after traveling a few years, became a country curate; then a theological professor in King's College, London; next, dean of Westminster; and, finally, archbishop of Dublin. His principal writings are *Notes on the Miracles*, *Notes on the Parables*, *Lessons in Proverbs*, *Synonyms of the New Testament*, *Deficiencies in our English Dictionaries* and *The Study of Words*. He helped (1870-81) to revise the King James' version of the New Testament. He died at London, March 28, 1886.

Tren'ton, N. J., capital of New Jersey and county-seat of Mercer County, on Delaware River, 33 miles from Philadelphia and 57 miles from New York City. It is served by the Delaware and Raritan Canal and Pennsylvania and Reading railways, and has trolley-connections with Philadelphia, New York and the principal cities of New Jersey and eastern Pennsylvania. It was settled in 1680, named in 1714 after William Trent who owned the site, and became the capital in 1790. Trenton was the scene of a battle, by some authorities considered the turning-point in the Revolutionary War, on Dec. 26th, 1776, when Washington crossed the Delaware, surprised the Hessians, and took over one thousand prisoners. The state-buildings include the capitol, asylum for the insane, reform-school for girls, prison, arsenal, armory, library and museum, normal-school and school for the deaf. Other prominent public buildings are the public library with 65,000 volumes, Federal court and postoffice, city-hall, court-house, 4 hospitals, 80 churches and 32 public schools. There also are 14 parochial schools, three business colleges, St. Francis College and a number of private schools. Among the most interesting historical buildings is the old French-and-Indian barracks, built in 1758. Battle Monument, 150 feet high, marks the position of the artillery under Col. Knox and Captain Alexander Hamilton at the opening of the Battle of Trenton. The leading industry is the manufacture of pottery. There are 42 potteries in the city. They manufacture all classes and grades of ware, from the commonest porcelain ware to the finest egg-shell china. More than half of all the pottery produced in the United States comes from the Trenton factories.

Besides the pottery works, the principal industrial plants are the iron-works and wire-mills of the J. A. Roebling Sons Co. (builders of the first bridge connecting Brooklyn and New York.) John A. Roebling, the founder of the company, was the engineer who designed the first important suspension-bridge in America, that over Niagara River. There are numerous other manufactories of iron and steel, structural iron, cables, chains, wire-cloth and netting, anvils, vises, iron and brass castings, engines and machinery. There are many brick and tile works, rubber-works, oil-cloth and linoleum factories, furniture-factories, spring-bed and mattress factories, woolen mills, breweries and cigar-factories. The various industries employ about 25,000 men. Population, 103,180.

Trian'gula'tion, a branch of surveying and geodesy, in which the positions of points on the earth's surface are determined by measuring with great accuracy a base-line and then constructing triangles on this. By measuring the angles and knowing the base line, the other distances become a matter of trigonometrical calculation. In connection with the survey of the United States being made by the coast and geodetic survey, a series of such triangles extending across the country has been fixed with great accuracy. The exact shape of the earth is determined from such triangulation in connection with astronomical observations of latitude and longitude.

Trib'unes, Roman, were popular magistrates elected annually from among the *plebs*, Romans not of noble birth, to safeguard popular interests. According to tradition the right of election of tribunes was wrested by the plebeians from the patricians in B. C. 494 by the device of a secession. The rights and powers of the tribunes gradually increased. From the first they had the right of protecting accused plebeians; and their persons were inviolable. Their principal acquired power was that of veto of a proposed law. The tribunes had by the time of the Gracchi become serious rivals of the consuls, the chief magistrates. Their number was increased to as many as ten; so that in politics any one of ten officials might obstruct legislation. As in the case of the Gracchi, the tribunician power was often over-ridden and was finally usurped by Octavian when he became emperor under the title of Augustus. In addition to these tribunes of the people there were officers in the Roman army with the title of tribune. The name in this sense originally meant an officer of the tribe; and may be traced back to the ancient tribal organization of the Roman army. There were six military tribunes in each legion, at first chosen by the consuls, but afterwards elected in the assembly of the tribes. Their powers were wholly military, not political.

Trichina (*trĭ-kī'nȧ*), a minute worm, parasitic in the muscles of swine and some other animals and very dangerous, since it can be transferred to man. The transformation comes by eating raw or imperfectly cooked pork. This worm (*Trichina spiralis*) was discovered in 1835 by Richard Owen. It is about one twenty-fifth of an inch long. When quiet, it lies coiled in a capsule or cyst within the muscles of the infected animal. When infected meat is eaten by man, the capsules are dissolved within the stomach and the worms set free An immense number of new and very minute worms are soon produced — each female being able to supply 1,500 to 2,000 eggs. The newly hatched worms bore through the walls of the intestines and get into the blood-vessels and lymphatic passages, and are thus carried all over the body. They make their way from the blood-vessels into the muscles, and there become full-grown and inclosed in capsules. From that time they are quiet, and, if the patient can survive the period of migration, he recovers. The connection of this worm with the disease was made known about 1860 by Leuckart, Virchow and others. It is difficult to say how swine become infested, but the worm is found in the rat, and as these are about slaughter-houses and sometimes eaten by pigs, the infection may come in that way.

Trichogyne (*trĭk'ō-jīn*), (in plants), a tubular, hair-like process developed from the female organ (*carpogonium*) of the red seaweeds. See RHODOPHYCEÆ.

Trichome(*trĭk'ōm*), (in plants), a general term applied to outgrowths from the epidermis, chief among which are hairs. See HAIR.

Trieste (*trē-ĕs'tȧ*), a seaport of Austria (*q. v.*), at the head of the Gulf of Trieste, on the Adriatic Sea, 90 miles northeast of Venice. There is an old town, with narrow streets and black walls, built on the slope of a hill and surmounted by a castle. Its cathedral has stones with Roman inscriptions built into its walls and a tower resting, it is said, on the foundation of a temple of Jupiter. The new town, on the plain toward the sea, is a handsome city with a fine harbor. There are extensive manufactures for making soap, rope, white lead, wax and leather. The people are Germans, Italians, Greeks, Jews and Dalmatians, but the majority speak Italian. Trieste, as Tergeste or Tergestum, was plundered by neighboring tribes as early as 51 B. C. In 1382 it passed into the hands of Austria. Population 229,475.

Tri'lobite, among fossils, any individual of the order *Trilobita*, so called from the division of the external skeleton into three regions. These comprise a cephalic shield or head; a variable number of body-rings; and a caudal shield or tail. They vary greatly in size, some being scarcely larger than a pin's head, while species of *Asaphus* have been met with that are two feet in length. They appear to have lived in shallow water, feeding on small marine animals. They are found in large numbers in the paleozoic system of rocks.

Trinidad (*trĭn'ĭ-dăd'*), the most southern of the West Indies, lies off the coast of Venezuela, nearly opposite the mouth of the Orinoco. It is 50 miles long and from 30 to 60 wide, and includes 1,754 square miles. The two channels to the harbor are called the Dragon's Mouth and the Serpent's Mouth. On the northern coast are forest-covered mountains, one with two peaks, called Tamana, while the rest of the island abounds in fertile valleys and plains. There are some good-sized rivers and several fine harbors. A lake, with pitch floating on its surface, is one of the curiosities of the island. (See ASPHALT.) The most important products are cocoa, sugar, rum, molasses, coffee, cotton, cocoanuts and oil. There are 250 public schools, with 40,956 pupils, many private schools, Queen's Royal College and a Roman Catholic College, with a total of 427 students. The chief town, Port of Spain, originally built of wood, was burned in 1808. The new town, built of stone, is one of the finest in the West Indies. The island was discovered by Columbus in 1498 and named Trinidad, because he first saw three mountain-summits from his ship. In 1797 it was taken by the British from the Spanish, and in 1889 Tobago was annexed. It has 81 miles of railway and 1,147 of telegraph and telephone. There are steamship lines to England, Holland, North America and Venezula. Population 330,074.

Trinidad, Colo., a city, the seat of Las Animas County, in the eastern foot-hills of the Rocky Mountains, on Las Animas River, and on the Denver and Rio Grande; Atchison, Topeka and Santa Fé; and Colorado and Southern railways, 85 miles south-southeast of Pueblo. In the vicinity there is a good farming and cattle-raising country, and it is rich in coal, and produces much livestock, alfalfa, beans etc. It has good municipal buildings, churches and schools, a public library, an hospital, an academy and an attractive park. Besides its coal-mines, railway-shops, foundry and ice-plant, it has a wool-scouring mill, a brewery, a cigar-factory, a brick-yard and bottling works. Population, 14,750.

Trinity College, Toronto, Can., was founded by Bishop Strachan to secure for the youth of the church the best secular education in the arts and sciences combined with the religious teaching of the Church of England. By the generosity of churchmen in Canada and in England a liberal endowment was raised and a building erected in 1851. The college was formally opened in 1854. St. Hilda's College (for women) was established later and affiliated

with it. In 1903 Trinity became a part of the University of Toronto along with Trinity Medical College, Ontario Medical College for Women and Toronto Conservatory of Music. The buildings of Trinity College (Tudor front, carved stone ornamentation) are beautifully located in a park of 35 acres. Trinity's contribution during half a century to the cause of education in Ontario is inestimable.

Triple Entente. For many years previous to the outbreak of the Great War of 1914, Great Britain and France had drawn closer together owing to the growth of the power of Germany and their interest in the preservation of "the balance of power." Largely through the influence of Edward VII they reached the agreement known as the Entente Cordiale, or "Cordial Understanding." Its terms, made known in Parliament in 1911, provided for British aid to France in case of an attack by Germany; and was an important factor in the international crisis over Morocco (*q. v.*), when England came to the support of France. Three years after the establishment of this understanding Great Britain and Russia—who had long been at odds over their respective spheres of influence in Persia (*q. v.*) and the Near East—also made a treaty, with the result that the Dual Alliance between France and Russia expanded into what was known as the "Triple Entente."

Tripoli (*trip'o-li*), one of the Barbary states of North Africa, between the desert and the Mediterranean, with Benghazi covers 398,900 square miles. The Atlas Mountains, which end here, run parallel to the coast and are lower than in the other Barbary states, being not more than 4,000 feet high. There are no rivers and very little rainfall, and vegetation must depend on the heavy dews. In the coastal regions, which are very fertile, cotton, grain and tropical fruits grow, while in the interior senna, dates and carrots are grown and the lotus flourishes. Sheep and cattle are raised in large numbers, and the horses and mules are celebrated. The trade, once considerable, has declined since new routes through Central Africa have been opened. Tripoli belonged to the Carthaginians, was taken from them by the Romans; then passed into the hands of the Arabs. It was taken by the Turks in 1552, and from them by Italy in 1911. Population estimated at about 600,000.

Trip'oli, a city of Africa and capital of the Turkish province of Tripoli, is on a point of rocky land projecting into the Mediterranean. It is the principal seaport, and is built with high walls and bastions, mosques, synagogues and Christian churches. It has some important manufactures, as leather, carpets and scarfs. It is the starting-point for caravans for the Sudan, which give it a large trade, though somewhat decreasing of late years. The people are nearly all Mohammedan, but business mostly is in the hands of the Jews and Christians. Population 35,000.

Tri'reme, the name given anciently to a galley or vessel with three banks of oars. The oars were arranged in banks or rows, one above the other. The oars of the lowest rank were the shortest, and the rowers had the easiest work and the least pay. There was a small sail also that could be used with a good wind. The crew consisted of 200 men, and often they moved the vessel as swiftly as a modern steamboat. The crew was usually composed of convicts and of slaves, taken in war, and could hope for no release save that of death. The triremes were used in the Persian and Peloponnesian wars, but later the galleys were made with five banks of oars and called quinqueremes. See GALLEY.

Tris'tan and Isolde'. A music-drama in three acts; words and music by Richard Wagner. Completed in 1859, and first performed in Munich in 1865 under the direction of Hans von Bülow (1830–94). The work was written during 1857–9 — a period in which Wagner was also engaged on *The Ring of the Niebelungen.* Wagner entitled this opera *Eine Handlung* (an action). He uses the Celtic legend of Tristam and Iseult, with modifications to suit his purpose. The dying song of Isolde, with which the work closes, has been effectively arranged as an instrumental number for the concert-room.

Triumvirate (*trī-ŭm'vĭ-rāt*), the name of an office among the Romans, filled by three persons. There were triumvirates for the regulation of public affairs, mentioned near the end of the republic. The government under Cæsar, Pompey and Crassus in 60 B. C. is called the first triumvirate, but the title was never formally given to them. The first triumvirate was that of Octavian, Antony and Lepidus in 43 B. C., though usually called the second. They held office for ten years. One set of triumvirs in Rome had charge of the night-police and another of the prisons.

Trol'ley-Cars are street-cars propelled by electricity by means of a trolley, a pulley working upon a wire overhead. The name, therefore, is appropriate only to electric tramways in which a rod is used to establish a connection between the motor of the car and the wire overhead. In America, however, the name is freely applied to other forms of street-car. Steam and horses have both been well-nigh discarded from street railways; even the cable-car has had its day; and the trolley-car properly so called, or the electric tramway, now reigns supreme. In 1890 there were 500 miles of cable-car lines in the United States, 6,000 of horse-car and 2,000 of electric tramways; but in 1908 the mileage of electric tramways had increased to 41,244 miles. Of the electric

trolleys, the most rapid and convenient are the underground-car systems in use in such cities as New York, London and Boston. In an overhead-trolley the current passes along the wire overhead, down through the rod to the motor, thence to the rails and so back to the central station. In America the posts for the overhead wires usually are plain and occasionally unsightly; in Europe usually ornamental and expensive. To avoid the cumbrous overhead construction, some trolley lines are constructed on the conduit-system. This is expensive, because it is necessary to construct a complicated conduit between or at the side of the rails, having a groove opening to the street, so that the so-called plow may connect the conductors in the conduit with the motor. There also is a movement in the direction of carrying storage-batteries in the car, as in New York City's 34th Street crosstown cars. Similar storage-batteries are of use in the regulation of the current along parts of third-rail systems, as the subway of New York City. See ELECTRIC MOTOR and ELECTRIC RAILWAY.

Trollope (*trŏl'lŭp*), **Anthony,** an English novelist, was born at London on April 24, 1815. He spent 33 years in the British postal service, and visited the United States, Austria and the West Indies in its interests. He invented the postal pillar-box. Some of his stories appeared first in *St. Paul's Magazine*, of which he was editor. His novels include *Orley Farm*, *The Bertrams*, *The Small House at Allington*, *Barchester Towers*, *The Last Chronicle of Barset* and many others, as he was a most prolific writer. He also wrote a *Life of Cicero*, a *Life of Thackeray* and works on *North America* and *South Africa*. His works number 70. He died on Dec. 6, 1882. Consult his *Autobiography*.

Trom'bone, a musical instrument, a form of the trumpet. The name is from the Italian, and means a great trumpet. It is a brass wind-instrument, so made in two parts that, by sliding one part into the other or drawing it out, the tube through which the air passes can be lengthened or shortened and the depth and power of the tone changed. Three kinds of trombones are used, called alto, tenor and bass trombones, according to the pitch. The tone of the trombone is grander and more powerful than that of the trumpet, making it a very effective instrument in an orchestra.

Tromp, Martin Harpertzoon van, a Dutch admiral, was born at Briel, Holland, in 1597. He was captured at sea, when a boy, in a fight on the coast of Guinea, in which his father, a Dutch commander, was killed. He served as cabin-boy for his captors for more than two years. In 1624 he was in command of a frigate, and in 1637 was at the head of a squadron of 11 ships. His first victories were over the Spanish fleet, taking 13 ships in one battle, Oct. 21, 1639. In November, 1652, he encountered the English fleet under Admiral Blake in the Straits of Dover, and drove them before him, sailing up the Channel with a broom at his masthead, to denote that he had swept his enemies from the seas. He was defeated by the English in February, 1653, after a terrible three days' fight; and again in June of the same year, when he lost 17 vessels. On Aug. 10 the struggle between the Dutch and English was renewed, the Dutch losing 30 men-of-war and Tromp himself. He was buried at Delft.

Trop'ic-Bird, the name for three species of sea-birds commonly seen in the tropics far from shore. During the breeding-season they frequent rocky shores and cliffs, but build no nests. The more common variety, sometimes seen on the coast of Florida, is about the size of a partridge. It has white plumage with fine black markings above and black bands on its wings. These birds have the two central tail-feathers greatly prolonged, and, therefore, are called marlinspike by the sailors; and because of their loud, shrill cry, the sailors also name them bo's'n-bird. The young do not in the least resemble the adults, but look like balls of white down. From the tail of the roseate tropic-bird the Pacific islanders procure the highly-prized red feathers worn by warriors in battle.

Trop'ics, the two lines of latitude parallel to the equator, drawn, one through the winter, and the other through the summer, solstice. They are equally distant from the equator, being about 23° 28′ north and south of it, and include between them all those points of the earth's surface where the sun always is vertical or directly overhead. The northern line is called the Tropic of Cancer, because the sun, which is directly over this tropic at the summer solstice, then enters the constellation of Cancer; the southern line is called the Tropic of Capricorn, because the sun, when vertically over it, enters the constellation of Capricorn. The country between the two tropics is called the torrid or hot zone, and the temperature is known as tropical. The word tropic comes from a Greek word meaning a turning, and indicates that the sun turns back at these lines.

Troubadour (*trōō'bȧ-dōōr'*), in southern France, Spain and Italy a class of poets distinguished from minstrels and strolling musicians by the fact that they indulged in verse-making for the love of it, and not for money. In northern France they were called *trouvéres*. They were often attached to the courts, and were attended by minstrels or *jongleurs*, who accompanied them on musical instruments, as it was usually considered beneath the dignity of a troubadour to be his own fiddler. The

troubadours' poetry consisted mostly of love-songs, though they sometimes touched upon the wars of the period or ventured to upbraid the evil customs of the times. At court-festivals there often were several troubadours, who engaged in verse-contests on subjects suggested by the ladies of the court. They flourished about from 1090 to 1290. Among the best-known troubadours were Richard the Lion-heart, Pierre D'Auvergne and Pierre Vidal, while the counts of Provence and of Toulouse, the kings of Aragon and of Castile, King Richard and Eleanor, queen of Henry II, are among their most illustrious patrons.

Trout, the name for a number of fresh-water fishes belonging to the same family

TROUT

as the salmon. The latter also is usually embraced under the name trout. They live in cold, clear streams and lakes, and are among our best food-fishes. They naturally are inhabitants of the northern hemisphere, but have been introduced into New Zealand and Australia. The common river and lake trout of Europe are black-spotted varieties, and reach a larger size than the American river-trout. Two kinds found in the United States are worthy of especial mention, the lake-trout and the brook-trout. The former is also called Mackinaw trout. It inhabits the Great Lakes and other lakes from New Brunswick to Montana and north to British Columbia and Alaska. It reaches a length of three feet or more. The brook-trout, which really is a charr, with its minute scales and beautiful red spots, is one of the most exquisite fish in appearance to be found anywhere, and it is unsurpassed as a food-fish. It ranges from Maine to Dakota, always in cold streams. Its length is from five to twenty inches, and it reaches an extreme weight of twelve pounds. In the Rangeley Lakes of Maine specimens have been caught and weighed that exceeded even twelve pounds. The trout west of the Rocky Mountains embrace the only black-spotted trout native to the country. Some of them live in warmer streams than their eastern relatives. The rainbow-trout is black-spotted and approaches nearly to the European river-trout. The latter, with some other forms, have been introduced into the waters of the United States.

Trow'bridge, John Townsend, American novelist, poet and editor, was born at Ogden, N. Y., Sept. 18, 1827, and was partly educated at a classical school at Lockport, N. Y. Early in life he lived on a farm and occasionally taught school, and in 1847 he went to New York and began to write for the press. He removed to Boston, contributed to magazines and journals, and took actively to authorship. His chief works are *Cudjo's Cave*, *The South and Its Battlefields*, the *Jack Hazard* series, *The Drummer-Boy*, *The Tide-Mill* series, the *Toby Trafford* series and the *Start in Life* series. He has also published *The Vagabonds; The Book of Gold; The Emigrant's Story;* and *My Own Story.* He died in 1916.

Troy, a famous city of Asia Minor, the seat of the Trojan War, which forms the subject of Homer's great *Iliad.* It was situated, according to the poem, at the foot of Mt. Ida, in the northwestern part of Asia Minor, with a plain in front stretching for nine miles, called the Plain of Troy. The city was also called Ilium. Paris, the son of King Priam of Troy, carried off Helen, the wife of King Menelaus, king of Sparta, and the most beautiful woman of her age. The Greeks, after spending ten years in collecting a fleet of 1,186 ships and an army of 100,000 men led by Agamemnon, drove the Trojans into their city, and after a siege of ten years the city was destroyed. In the tenth year of the siege occurred the quarrel between Agamemnon and Achilles which is the subject of Homer. It so weakened the Greeks that they were driven back to the sea. Vergil in *The Æneid* tells the story of the wooden horse filled with warriors, left before the walls of Troy by the apparently retiring Greek army, which was drawn into the city. The warriors, thus introduced, opened the gates to the returning army, and Troy was taken by stratagem. After the fall of Troy a new city sprang up, called New Ilium, which occupied the site of Hissarlik, about four miles from the mouth of the River Mendereh, now believed to be the Scamander of *The Iliad.* This spot has been excavated by Dr. Schliemann, and the remains of a great city found, thought to be those of ancient Troy. See ACHILLES, ÆNEAS, AGAMEMNON, HELEN, HOMER, ILIAD, ILIUM, MENELAUS, ODYSSEY, SCHLIEMANN and ULYSSES. Consult Schliemann's *Troy and Its Remains.*

Troy, N. Y., county-seat of Rensselaer County, on Hudson River, six miles north of Albany, is at the head of steamboat

navigation. There is a large dam across the Hudson, which, with two small streams falling 200 feet from hills back of the city, furnishes a large water-power. It is connected with Lakes Champlain, Ontario and Erie by canals. Among its public buildings are the city-hall, orphan asylums, Earl crematory, an athenæum and the union-station, one of the finest in the country. The city annually expends $144,220 on its public schools, which have 211 teachers and 6,357 pupils. Troy Female Seminary, established in 1821, was one of the first institutions of the kind in the country, and is still successfully maintained. Rensselaer Polytechnic Institute and St. Joseph's Theological Seminary are among its schools. The principal manufactures are of iron, its factories and furnaces being the largest in the eastern part of the Union. It manufactures bar-iron, railway-spikes, nails, screws, bolts, stoves, furnaces, hollow ware and machinery. It has the largest factory of mathematical instruments in the country, and the shirt and collar factories are very extensive. The old Vanderheyden house, built in 1752, was the first house on the site of Troy, and the place was known as Vanderheyden's Ferry and as Ferryhook until 1789, when it was named Troy. It has been almost destroyed by fire three times. Population 76,813.

Truf'fles, the common name of certain edible fungi, belonging chiefly to the genus *Tuber*. Nearly all are subterranean and appear as tuber-like bodies developed on a mycelium. Truffles are among the most prized of the edible fungi, and are chiefly cultivated in Europe. See ÆCIDIOMYCETES.

Trum'bull, John, an American painter, was born at Lebanon, Conn., June 6, 1756. He graduated at Harvard College, and studied his art at Boston. He served in the army during the Revolutionary War as adjutant of the first Connecticut regiment, aide-de-camp to Washington, major and colonel, resigning in 1777. While studying painting in London in 1780, he was imprisoned for eight months during the excitement produced by the execution of André. His first American historical pictures were *Battle of Bunker Hill* and the *Death of Montgomery*. He painted portraits of Washington and other Revolutionary characters. In 1817 he was employed by Congress to paint four pictures for the rotunda of the capitol, and as subjects chose *The Declaration of Independence*, *Surrender of Burgoyne*, *Surrender of Cornwallis* and *Resignation of Washington*. His historical paintings, numbering 57, were given by him to Yale College, and are valuable as collections of portraits of the prominent actors of the period. He died at New York, Nov. 10, 1843. See *Autobiography*.

Trumbull, Jonathan, an American statesman, was born at Lebanon, Conn., Oct. 12, 1710. A graduate of Harvard College and a theological student, he was turned aside into business by the death of his elder brother. He became a member of the general assembly of Connecticut in 1733, speaker in 1739 and assistant in 1740, being re-elected 22 times. He was chief judge of the superior court for three years and governor of the colony for 14. He was prominent in the opposition to England before the Revolutionary War, refusing to take the oath to support the Stamp-Act, and his advice was sought by Washington, who looked upon him as one "of his main pillars of support." The name of Brother Jonathan, given to the United States, is attributed to Washington's frequent remark, alluding to Trumbull: "Let us hear what Brother Jonathan says." He died at Lebanon, Conn., Aug. 17, 1785. See *Life* by Stuart.

Trumbull, Lyman, American jurist and senator, was born at Colchester, Conn., Oct. 12, 1813, and died at Chicago, June 25, 1896. He studied law in Georgia, was admitted to the bar, and settled in Belleville, Ill., where he was elected to the state legislature, became secretary of state, and in 1848 was elevated to the bench of the Illinois supreme court. In 1854 he was elected to Congress, and in the following year became a member of the United States senate. During and after the Civil War he was a prominent Republican, acting earnestly with that party, favoring the abolition of slavery, but opposing the impeachment of President Johnson. He subsequently supported the Democratic party, and in 1880 was Democratic candidate for the governorship of Illinois.

Trump'et, a musical wind-instrument, of great antiquity. In its modern form it is a tube eight feet long, having a bell-shaped end and doubled in a long curve, about three feet long, and is played from a mouthpiece. It has a range of over two octaves. It has been used in war, and is a common instrument in military bands.

THE EAR-TRUMPET is an instrument which collects the waves of sound and carries them to the ear, thus enabling a deaf person to hear better. The small end is placed at the ear and the large end is open to the air or placed at the mouth of the person speaking.

THE SPEAKING-TRUMPET is a straight tube with a mouthpiece, which collects the sound-waves, so that the voice of a person speaking into it is louder, and the sound is carried farther.

Trumpet-Flower, a popular name for a vine with a woody stem and clusters of scarlet flowers shaped like a trumpet It grows to a great height and very rapidly, and is found in the central and southern states of the Union, where it is often called trumpet-creeper. Other varieties from China, Japan, Australia and South

America are cultivated in gardens and greenhouses.

Trusts. In the United States this term has come to mean a form of commercial association between individuals or corporations engaged in producing the same commodity, for the general purposes of regulating the amount of production; of establishing a uniform price; of diminishing the cost of competition; and of controlling the markets, in part at least upon the principle of monopoly. Such an organization is managed by a board of trustees to whom all the corporation stock of the constituent companies is irrevocably assigned.

There are several methods of organizing a trust. Each of the combining parties may lease his concern to one central body; or one central corporation purchases as fast as they are manufactured all products of the various parties, and then a fixed price is placed on the aggregate production of each party, and trustees are elected who control the sale of the whole product and divide the products proportionally among the various companies. The more usual plan of operation is as follows: All parties entering the organization become incorporated; then the stock of all the corporations is handed over to trustees who in exchange for stock thus deposited issue trust-certificates. They also elect directors who have complete control of the affairs of the concerns associated in the trust. Trust-certificates are transferable; dividends are issued according to the proportion of certificates held by each party. Trustees are elected annually by the holders of certificates, and through the directors they possess almost unlimited power over individual concerns. They may cause one concern to stop producing altogether, may limit productions, fix prices and the amount and manner of sales; in short, they control the entire field.

To illustrate: A few years ago 16 of the large sugar-refineries in the United States, furnishing the greater part of the sugar consumed, joined in a trust with a capital of 50 million dollars. As soon as the combination was effected, five of the factories shut down. At once the margin between raw and refined sugar began to widen. To the producer of raw material they dictated the price, for there was but one buyer, and to the consumer they dictated prices, for there was but one seller. Such forms of trusts have been declared illegal in the courts of every state where the matter has been contended.

The first important trade-combination of this sort formed was that of the Standard Oil Trust in 1881. It was quickly followed by the Cottonseed-Oil, Sugar, Tobacco and Lead Trusts etc.; and by the census of 1900 there were 185 such combinations of formerly independent concerns.

Trusts are the outgrowths of the ruinous competitive system, due to ease of intercourse and the difficulty of readily withdrawing capital once invested in fixed plants. They save salesmen's salaries, competitive advertising, cross-freights, running plants part time etc. They permit the standardizing of machinery and the organization of workmen under competent leadership. The large profits made by financiers and promoters, sometimes assisted by governmental favors, have encouraged their rapid multiplication in number and size. The tariff, by lessening foreign competition, is given as an indirect cause of the formation of trusts as is also monopoly granted by patents, copyrights and trademarks.

The U. S. Circuit Court for New Jersey in a suit brought by the government to dissolve the United States Steel Corporation under the Sherman Law held, June 3, 1915, that it was not a combination in restraint of trade; that the mere size of the organization and the volume of its business was no offense and that the company's policies, except in its attempts to regulate prices by agreement with competitors—a practice discontinued before the suit was brought—had not produced unfair or dangerous consequences. Many of the direct competitors of the corporation and several of its customers testified in its behalf as having been the chief instrument in maintaining fair competition and helping to secure fair and stable prices, a condition so important in the iron industry.

Many trusts are founded upon a natural monopoly; that is, they control the supply of raw material, and by the extension of this control they put competitors at a great disadvantage, especially when, as in the case of oil, coal and iron, these raw materials are found in limited fields and quantities. A trust may become a monopoly to the degree in which it governs the supply of raw material for the industry which it seeks to control.

Recent antitrust movements have brought to light a number of evils peculiar to corporate finance; chief among them are wildcat promotions, payment of unearned dividends, speculative management and over-capitalization. By wildcat promotion is meant the action of the promoter who issues stock far beyond the actual cash-value of the plants under consideration. He pays for the plants with whatever stock is necessary, and retains the remainder, often securing for himself 20% of the capital of the organization paid to him in common stock. Besides this, the man who finances the company sometimes receives a premium of 50 per cent. for his risk. The capital stock usually is both preferred and common, the preferred representing the properties, including cash and cash-assets, which receive a fixed dividend of six or seven per cent, but do not participate in

any way in earnings in excess of the fixed percentage. In case the earnings are below this rate, the "unearned dividends" must still be paid at the expense of the common stock. The common stock represents expected earning-capacity, on which the income fluctuates with the success of the enterprise.

The effect upon prices has been a subject of much discussion. It is commonly said that trusts inevitably drive all small concerns to the wall and build up a few large establishments on their ruins, and also that monopolies' price, wherever possible, is far above the price level of competition. In discussing this question we may assume that competitive prices are fixed mainly by the cost of producing that part of the output which is produced at the greatest disadvantage, and also that monopoly price is fixed at that point which will secure for the monopolist the greatest net return. While the ultimate effect upon prices cannot yet be determined, many instances show that in individual cases, for short periods of time, the trusts have actually lowered prices below the former competitive rates. Likewise numerous instances can be found of prices raised above such former rates, usually after the markets have been secured. The Industrial Commission has shown that the influence of the trusts has increased the margin between the cost of raw material and the finished product.

Owing to popular dissatisfaction and alarm at the abuse of power by some of the trusts the Sherman Anti-Trust Law was passed in 1890, following that establishing the Inter-state Commerce Commission (*q. v.*) in 1887. Both measures were aimed at what was regarded as unfair business methods; but as it was found difficult to interpret and apply the Sherman Law in any given case in advance of costly lawsuits, and because it was asserted the abuse of power by the trusts had been but little affected, further legislation was demanded. The result was the passage in 1914 of the Clayton Bill as a check upon the trusts, and the bill establishing the Federal Trade Commission to better enforce the laws for the regulation of trusts.

The Clayton Law forbids interlocking directorates; discrimination in price, where such discrimination tends to create monopoly; agreements fixing price; contracts shutting out the goods of a competitor, ownership of stock by one corporation in another where such ownership lessens competition. No person can be an officer or employe in more than one bank or trust company. (This does not apply to the inter-organization of banks in the Federal Banking System, v. p. 488). Laborers and agriculturists are permitted to organize "for mutual help;" for the purpose of marketing products to the best advantage, maintaining quality and—in the case of labor organizations (*q. v.*)—collective bargaining for wages.

Tsad or **Tchad** (*chăd*), a lake in central Africa, about 150 miles long and 120 wide. Two large rivers flow into it, but it seems to have no outlet, though there are signs of an ancient river-bed, bordered by trees, in which the Arabs say water flowed for 100 miles during a flood in 1870. There are populous villages on the shores, and the many islands in the lake are densely peopled by pagan tribes, dark brown or black, with regular features, wearing cotton-garments and cultivating cotton and corn.

Tschaikowsky (*chī-kôf'skĕ*), **Peter Ilitch,** a distinguished Russian composer, was born at Votkinsk in the province of Vyatka, April 25, 1840, and died at St. Petersburg, Nov. 7, 1893. Early in life he held a government-post in the Russian service, but this he abandoned in 1862 to study music in the conservatory of music at St. Petersburg, where he was instructed in harmony and counterpoint by Zaremba and in composition by Rubinstein. After graduating, he for a number of years was professor at the conservatory of music at Moscow, where he composed many melodies gathered from the airs of the folksongs of his native country and characterized by weird and plaintive music. Among his compositions are overtures, symphonies, concertos, marches and operas, many of which are of great sweetness and beauty. In 1889-90 he visited London, appearing there at Philharmonic concerts, and in 1891 he came to New York City at the invitation of the New York Symphony Society, where he gave renderings at Carnegie Music Hall of many of his own compositions.

Tset'se a two-winged insect slightly larger than the common fly, inhabiting portions of South Africa. Its bite usually is fatal to the ox, horse and dog, but harmless to man, the goat and wild animals living in that region. It lives by sucking blood, but its bite is not immediately fatal, the bitten animals sometimes lingering for weeks and months. It is so local in its distribution, that it is sometimes seen in swarms on one side of a river while cattle are grazing undisturbed on the other.

Tu'ber, a form of underground stem, which is much thickened by food-storage, as the common potato. It usually shows its nature as a stem by bearing minute leaves (scales) or buds, as the "eyes" of the potato. Tuber also is the name of the genus of fungi to which the truffles belong.

Tube'rose', a plant which belongs to the same family as the amaryllis, having a bulbous root; long, slender leaves; and a cluster of very fragrant, white, wax-like flowers, growing at the end of a stalk two or three feet long. The bulbs were brought at first from Holland and Italy, but now are raised fn the United States, those grown in Georgia and Florida being larger than the imported

ones. It is a tropical plant, probably a native of the East Indies or Mexico.

Tü'bingen, See UNIVERSITY.

Tuck'er, John Randolph, American lawyer and statesman, son of Henry St. George Tucker, was born at Winchester, Va., Dec. 24, 1823, and died at Lexington, Va., Feb. 13, 1897. He was educated at the University of Virginia, studied law, and was admitted to the bar in 1845, and from 1857 to 1863 was attorney-general for his native state. The Civil War dispossessed him of this post, but he was appointed to the chair of equity and public law in Washington and Lee University and held that office four years (1870-4). From 1874 to 1887 he was a member of Congress, and acted frequently as chairman of the judiciary committee and of the committee on ways and means, and took an active part in the Congressional debates on the tariff. His oratory was frequently listened to in the house on many other important topics and themes of legislative import.

Tuck'erman, Henry Theodore, an American writer, was born at Boston, April 20, 1813. He spent several years in Italy in the study of art and literature. His works appeared mostly as contributions to periodicals. They include *The Italian Sketchbook*; *Sicily; Thoughts on the Poets,* translated into German; *Artist-Life or Sketches of American Painters, Book of American Artists;* poems; and essays. He died at New York, where he had resided for many years, on Dec. 17, 1871.

Tucson (*tū-sŏn'*), **Ariz.,** the largest city in the territory, is about 60 miles north of Mexico. It is 2,520 feet above the sea, in the valley of the Santa Cruz. The old part of the town looks like a Mexican city, with plazas, narrow streets and adobe houses, but the newer parts are American. The climate, mild in winter, is very hot in summer, and the yearly rainfall is only seven inches. The church of St. Xavier, built more than 100 years ago by Roman Catholic missionaries, is near the city, and the university of the territory is here. The city is supplied with gas and water, and has a large trade with Mexico and in supplying the Indian reservations. Tucson was a Mexican military post, and came into the possession of the United States by the Gadsden purchase in 1853. Population 13,193.

Tu'dor, the name of one of the royal families of England, reigning from 1485 to 1603. The family came from Owen Tudor, at one time a brewer in Anglesey, who fought at Agincourt and so pleased Catherine, widow of Henry V, by his dancing at a court pageant that she married him privately. The queen took refuge in a convent and Tudor was sent to prison to escape the popular fury, when their marriage became known. Tudor escaped, and was protected by Henry VI, the young king. The oldest son of this marriage was made Earl of Richmond, and married Margaret Beaufort, a descendant of John of Gaunt. Their son became Henry VII of England, and by marrying the daughter of Edward IV united the houses of York and Lancaster and ended the Wars of the Roses (1455-85). There were five Tudor sovereigns: Henry VII, Henry VIII, Edward VI, Mary and Elizabeth. Consult *Early Tudors* by Moberly and *History of England* (1529-88) by Froude.

Tufts College, a college formerly controlled by the Universalist denomination, but now undenominational, is located at Medford, Mass., near Boston. It comprises colleges of letters, divinity; medical, dental, and engineering schools and Jackson College for Women. It has 262 instructors and 1,241 students.

Tuileries (*twē'le-riz*), **Palace of the,** a famous domicile of French royalty, now destroyed, in Paris, on the right bank of the Seine and adjoining the Louvre. The site originally was a tile-field, whence the origin of the name (the word signifying a tile-kiln). The palace was commenced in 1654 as a residence for Catherine de Medici, and was enlarged by Henry IV and by Louis XIV, the attached grounds being converted into ornamental gardens. When the palace of Versailles was erected, the Tuileries ceased to some extent to be used by the French kings. In the Revolution it was stormed and sacked by the frenzied Parisian mob (1792), and for a time became the seat of the national convention which governed France after abolishing monarchy. The Tuileries were also attacked and taken in the insurrections of 1830 and 1848, and during the Commune (1871) the buildings were burned, the ruins not being removed till 12 years later. Nothing of the palace remains except the pavilions which flanked it. In their restored order they terminate the two galleries or extended arms of the Louvre (*q. v.*).

Tu'la, a city in Russia, on Upa River, 110 miles south of Moscow. It has a large cannon-factory and manufactory of arms, founded by Peter the Great, and nearly 800 other factories which supply the Russian army with arms. Cutlery, locks, tea-urns and bells are made in large quantities, and the preparation of bristles for market is a large industry. Population 114,733.

Tu'lip, species of *Tulipa*, a genus of the lily family, and native to Central Asia. They are extensively cultivated for their beautiful flowers, and over 1,000 garden-varieties have been catalogued. Haarlem in Holland is the chief source for tulip bulbs. In the 17th century the cultivation of tulips became a mania in Holland, and enormous prices were often paid for single bulbs of some rare variety.

Tulip-Tree, the well-known *Liriodendron Tulipifera*, a member of the magnolia family, and most commonly but wrongly known

as poplar. It is one of the most magnificent forest-trees of the United States, with a noble shaft, great crown, broad and lobed leaves and tulip-like flowers. It is the source of the so-called poplar-lumber of commerce; from the color of its wood it is called whitewood; and in some localities it goes by the name of yellow poplar. The tree sometimes reaches a height of 190 feet, the ordinary height being 70 to 100 feet. It is rare in New England and west of the Mississippi River, but is found as far south as Alabama and Georgia. It grows rapidly and is hardy. Always attractive, in its time of bloom it is of much charm, bearing a wealth of erect, cup-shaped, yellow-green blossoms.

Tulloch (*tŭl'lŭk*), **John,** D.D., a Scottish theologian and author, principal of St. Andrews University, was born in Perthshire, June 1, 1823, and died at Torquay, Devon, Feb. 13, 1886. He was educated at Edinburgh and in Germany, and was one of the leaders of liberal thought in theology in his time. His writings embrace a Burnett prize-essay entitled *Theism the Witness of Reason and Nature to an All-Wise and Beneficent Creator; Leaders of the Reformation; English Puritanism and its Leaders; Rational Theology and Christian Philosophy in England in the 17th Century; The Christ of the Gospels and the Christ of Modern Criticism; Modern Theories in Philosophy and Religion; Movements in Religious Thought in Britain in the 19th Century;* volumes of sermons1 and an inspiring book for young people, entitled *Beginning Life.* He visited the United States in 1874. See *Memoirs* by Mrs. Oliphant.

Tul'sa, Okla., county-seat of Tulsa County, is in a fine agricultural section, which also is a coal, oil and gas belt. Shale, fire-clay, limestone and sandstone are in the vicinity. The city has excellent public schools, with free kindergartens, a business college and the Presbyterian State University. It is a city of good homes and churches. Tulsa has an excellent sewerage-system and the service of five railroads. Population 18,182.

Tum'bleweed, the popular name of various annual plants which have a bushy, branching habit and become more or less globular in outline by the curving of the branches. Being shallow-rooted, in light soil they are caught by the wind and tumbled along, sometimes being carried for many miles and scattering their seeds by the way. They belong to the prairies and great plains of this and other countries. One of the most common of the tumbleweeds has recently been imported into this country under the misleading name of Russian thistle. It is not a thistle, but a prickly member of the goosefoot family (*Salsola kali tragus*). It first appeared on the plains of Dakota, and has spread extensively.

Tu'nicates, an interesting group of marine animals, surrounded by a tunic from which their name is derived. They embrace animals called sea-squirts on account of their ejecting little jets of water from their terminal openings when irritated. They formerly were classified with worms or between the worms and the mollusks. In 1866, however, Kovalevsky, by observing their development, showed that in early stages they come near the structure of tadpole or of frog. Moreover, the steps in their development were shown to agree fully with those of the lowest recognized vertebrate, Amphioxus. The adult animals are fixed or sessile. The larvæ are free-swimming and, in some particulars, on a higher plane than the adults. They, for example, have a gristly rod or notochord in the back of the body and, above this, a nerve-cord in the same position as in vertebrated animals. They also possess gill-clefts. The notochord and dorsal nerve-cord disappear in the adult, but their presence in the larva makes it necessary to advance the tunicates into the vertebrated group, and it is now recognized that the possession of a notochord, a dorsal nerve-cord and gill-clefts marks the vertebrated animals and distinguishes them from all others. The work of Kovalevsky was epoch-making, because it broke down the supposed barrier between vertebrates and invertebrates, and opened the way for considering their affinities in an unbiased spirit. The tunicates are ovoid or barrel-shaped animals attached at one end to stones, weeds or other objects. The free end has two openings through one of which water enters and, after circulating through the gills, passes out of the other. They afford an illustration of degeneration in development. When free-swimming in their youth, they are on a higher level but soon become attached and, losing some of their organs, undergo retrograde development. See VERTEBRATES.

Tu'nis, once an independent state in what was called Barbary (*q. v.*), is a French protectorate in Africa. It is bounded on the north and east by the Mediterranean, on the south by Tripoli and the Sahara and on the west by Algeria. It is 440 miles long from north to south and 115 wide, covering 64,600 square miles, Missouri or Washington (state) being only about 5,000 miles larger, and has a population of 1,900,000 or less than that of Chicago. The coast is irregular, and there is only one river, but there are many salt-marshes. Capes Blanco and Bon on the northern coast are Africa's farthest north. The northwest is mountainous, some peaks rising 5,000 feet, the south a *steppe.* The country is fertile, the mountains being covered with great forests of oak and barley, figs, maize, olives, oranges and wheat being

produced abundantly. The olives are specially cultivated for their oil, and the wheat is exported in great quantities. Great herds of cattle graze on the plains, the horses and dromedaries are celebrated, and the sheep are famous for their wool. Copper, iron, lead, mercury, niter, phosphates, salt and silver are found, the production of phosphates being so large that a railway was built to transport it. There also are fine mineral springs and considerable fisheries. Trade is mainly with the interior, which sends gold, gums, ivory and ostrich-feathers for European countries. The people are Arabs mainly, but the population is of the most mixed character, containing traces of the ancient Numidian, Phœnician and Roman elements. There are 128,895 Europeans, Italians numbering 81,156, Frenchmen 34,610, while the native Jews total 60,000. The French army of occupancy numbers 20,362. The prevailing religion is Mohammedanism, and the revenue from Mohammedan property is applied to religious, educational and charitable purposes. The Christians include 35,000 Roman Catholics, with English and French Protestants and the native converts of their missions.

Under the Romans Tunis was about the same region as Carthage. It was conquered by the Vandals in the fifth, the Byzantines in the sixth and the Arabs in the seventh century. Louis IX of France (St. Louis) invaded it in 1270, Charles V of the Empire in 1525. Turki of Crete made himself master of the land in 1575, acknowledging, however, the suzerainty of the Turkish sultan at Constantinople. His descendants have occupied the throne since 1691, paying tribute to Turkey till 1871. Tunis was a nest of pirates down to 1816. France invaded the country in 1881, and forced the reigning prince, called a *bey*, to put himself under French protection. Government is administered by the French foreign office through a resident-general and his cabinet of nine ministers, two of these being Arabs. The governors of the 13 districts into which the land is divided are French, their subordinates Arabs. The French have suppressed the slave-trade, lifted burdensome taxes, established courts and provided municipal government for the capital. A department of arts and antiquities has been established, and a national museum formed. There are about 200 French and 1,500 Mohammedan schools, beside many private schools and a Muslim university. The French schools teach nearly 25,000 pupils. There are 704 miles of railroad, all in French hands, and $15,000,000 are being spent on building 356 miles more and on colonization. There also are 1,750 miles of good highroads, 2,250 of telegraph and 300 of telephone, and about 375 postoffices. The principal commercial ports are Tunis-Goletta, Susa and Sfax. The chief exports after wheat are barley and oats, cattle and sheep, hides, olive-oil, phosphates, zinc, lead and woolens. The main imports consist of ironwares, wheat, flour, barley, machinery, oats, sugar, coal, woolens, tobacco and coffee.

Tunis, the capital of the protectorate of Tunis, is near the mouth of the Mejirdah, about ten miles from the ruins of Carthage. It has a wall five miles around and a strong castle. The streets are narrow and dirty, and the houses of one story, with no windows on the outside. The bey's palace and some of the mosques are fine buildings, and the bazars are attractive. There are a Muslim university in the Great Mosque, a Roman Catholic cathedral, a Greek church, an Italian theater and large barracks. A national museum has been founded near Tunis, the Franco-Tunisian government having formed a department of Tunisian arts and antiquities. By means of a canal, opened in 1893, Tunis is accessible to oceanic commerce. It also has railroad connection with Algiers. The manufactures are of silk, wool, leather, soap, wax and olive-oil. Population 177,500, of whom 100,000 are Moslems and 50,000 Jews.

Tun'nel, an underground passage dug out without removing the earth above it. Tunnels are dug under bodies of water, and through mountains when the passage over or around would be less economical or less convenient. They may also be made under roads and streets for convenience of passage. The digging or boring of tunnels presents many different problems, depending on the character of the soil. In a mountainous country the operation usually involves drilling and blasting rock. Water is nearly always met with, particularly under rivers and lakes, and the methods of the pneumatic caisson have to be used. Most tunnels have to be lined with timber or masonry arches, to keep the roof and sides from caving in, and a common method is to carry forward with the digging a steel tube as lining for the excavation. The cost of tunneling has decreased greatly within a few years, owing to the introduction of special machinery for drilling and excavating. The number of large tunnels is now so great that it is impossible even to list them. The most notable ones in Europe are the Mt. Cenis, eight miles long, costing $15,000,000; the St Gothard, nine miles long, cost $12,000,000; and the Simplon tunnel, 12.3 miles long, cost $14,000,000. The Hoosac tunnel, on the railroad from Boston, Mass., to Troy, New York, is 4¾ miles long. It was 17 years in construction, and cost $11,000,000. Other notable American tunnels are the Grand Trunk railroad tunnel at Port Huron, Mich., under St. Clair River; the Chicago water-supply tunnel, four miles out under Lake Michigan;

the Sutro tunnel at the Comstock mines, Nevada. The Hudson River tunnel to connect Jersey City and New York City is now being constructed by the Pennsylvania Co. to give its road access to New York City and Long Island. The entire work of construction is nearing completion and trains will run under the river on all lines in 1909. The tube between Hoboken and Christopher Street, New York City, already is open. It is conservatively estimated that 77,000,000 passengers annually will travel through all four tubes of the Hudson tunnel system. It continues through a subway across the city and connects with one of the three tunnels under East River, a second connecting the street-car system of New York City with that of Long Island City and the third being the Brooklyn extension of the New York subway on from the Battery. (See NEW YORK CITY). The subway itself is 21 miles long, the greatest municipal undertaking of modern times, and is estimated to have cost $50,000,000. It has two tracks for expresses and two for local trains. In Chicago (*q. v.*) there is a subway with 45 miles of track in operation and 15 miles of extensions projected. It, however, is used only for freight-distribution in the business district. Among notable recent tunnels are those bored by the Southern Pacific Railroad at Santa Margarita, Cal., so as to extend their railroad along the coast from San Francisco to Los Angeles.

Tun'ny, a fish of the mackerel family, found in the Atlantic Ocean, and especially in the Mediterranean Sea. It is a very large fish, from nine to 20 feet long, sometimes weighing 1,000 pounds. It is thicker than the mackerel, dark blue, with silvery spots. The European variety is highly esteemed for food, and is caught in nets shaped like a funnel, the fish entering the wide mouth and being driven to the narrow end, where they are killed with lances and harpoons. Near Constantinople it appears in shoals so crowded that they are often taken by hand. The best tunny-fisheries are in Spain, Italy and Sardinia. The American tunny, found on the Atlantic coasts from New York to Nova Scotia, is black above and white below, and is used largely for oil, one fish sometimes yielding 20 gallons.

Tup'per, Sir **Charles,** G. C. M. G., Canadian statesman, was born at Amherst, Nova Scotia, July 2, 1821, and was educated at Edinburgh, Scotland, for the medical profession. From 1857 to 1860, having entered politics, he was a member of the executive council and provincial secretary of Nova Scotia, and from 1864 until federation he was prime minister. He was a strong advocate of Canadian federation, and in 1870 joined the Dominion cabinet, in which he held various portfolios and was one of the leaders of the Conservative party. As minister of railways and canals, he advocated the construction of the Canadian Pacific, for a time was finance-minister, was Canadian representative at the fisheries conference at Washington, D. C. (1887), and in 1896 became prime minister of the Canadian Dominion. From 1883 to 1887 he had been high commissioner for Canada in England. In the general election of 1896 his administration was defeated on the Manitoba school-bill. Mr. Tupper was knighted in 1879, created a baronet in 1888, and for a long time was leader of the (Conservative) opposition in the Dominion house of commons. He died Oct. 30, 1915. His son, Sir C. Hibbert Tupper, born in 1855, was minister of justice and attorney-general for Canada, 1895-6. He for a time was a member of the Canadian house of commons, representing Pictou, Nova Scotia. In 1892 he was created a K. C. M. G. for services rendered as agent of H. B. M. at the Paris Tribunal of Arbitation.

SIR C. TUPPER

Tupper, Martin Farquhar, an English author, was born at London, July 17, 1810. He was a graduate of Oxford, and was admitted to the bar. In 1838 he published *Proverbial Philosophy*, which was very popular with the people, though ridiculed by the critics, and has passed through 40 editions. His numerous works include *Crock of Gold; Hymns for All Nations; Stephen Langton;* and *Three Hundred Sonnets*, none of which at all equaled his first work in popularity. He died on Nov. 29, 1889.

Tura'nians, one of the large divisions of the human race. (Finno-Tartar and Ural-Altaic are other names for it.) It includes the Hungarians, Bulgarians, Lapps and Finns, with other tribes in Europe; the Samoyeds, living in the northern part of Asia; the Turks or Tartars, forming the largest division; the Mongols, divided into eastern Mongols and Buriats; and the Manchus, the principal race of the Tungusian branch, the present ruling people in China. Of these various tribes, those living in Europe are the most advanced in languages and customs, and those in northern Asia are the lowest of the race. The name usually given to those related tribes is taken from the Persians, who, calling their own country Iran, named the countries north of it Turan. They sometimes are called Mongolian, Scythian or Tartaric races. The Turanian languages do not present the same unmistakable family likeness as the Aryan and Semitic groups, and scholars differ in re-

gard to them, some including the Dravidian dialects of southern India and others considering the Mongol and Manchu dialects to be distinct languages. The Finnic branch of languages is superior to the others, having some national literature, as the legendary and popular songs of the Finns and Hungarians. Consult Müller's *Science of Languages* or Peile's *Philology*. See AUSTRIA-HUNGARY, FINLAND and LITERATURE.

Tur'bine, a form of steam-engine in which the rotation is produced by the impact of a jet of escaping steam on the blades of a wheel. There are two forms of the turbine in use: the Parsons and the De Laval. In the Parsons turbine the steam from the boiler strikes the blades of a series of turbines fixed on one shaft, and finally escapes into a condenser or into the atmosphere at a low pressure. In the De Laval turbine the jet of high-pressure steam strikes a series of steel-buckets on a wheel similar to a Pelton water-wheel. The speed of turbines is very high. That of a 150 H. P. Parsons turbine is 4,800 revolutions per minute, while that of a 50 H. P. De Laval machine has the enormous speed of 15,000 revolutions per minute. These very high speeds require special reducing-gearing before use for most machinery. The Parsons turbine was first successfully used directly on dynamos and also on the shafts of the propeller of an experimental steamer, the *Turbina*. This was then the fastest boat in the world, having made 34½ knots per hour. It is 100 feet long, and has three turbines of a total H. P. of 2,000. Tests of turbines have shown a remarkably low consumption of steam per H. P., that of small turbines rivaling that of the best, large, compound steam-engines. For steamships a great advantage claimed, in addition to economy, is that of the small size and weight of the turbines. Mechanically the turbine has the great advantage over the piston steam-engine in that no mechanism is needed to change a backward and forward straight-line motion into rotary motion. Much is being done to develop the turbine, but practically there are only two ways of increasing its efficiency. One is to improve the machine; the other is to improve the management of the working fluid. In general, the larger the marine turbine, the simpler the construction, the higher the steam's efficiency and the lower the rate of rotation. In 1899 turbines 35 and 50 inches in diameter were used in *The Viper*, a torpedo-boat destroyer; and though this is only 210 feet long and of 375 tons displacement, the turbines developed 11,000 horse-power and over 43 miles an hour. No vibration was produced, the engine-room being so quiet that it was difficult to realize the presence of the engines. In 1901 the turbine was applied to passenger steamships and the steamer (of 1,429 tons) averaged 18½ knots an hour. The success was so pronounced that the Cunard Company at once built The Lusitania and The Mauretania (see STEAMSHIPS) and equipped each with quadruple-screw turbines. The commercial practicability of the turbine has been demonstrated.

Tur'bot, one of the flatfishes found in almost all European seas. It ranges from the Mediterranean to the coast of Scandinavia. It is highly esteemed as food, being the best of all the flatfishes in that regard. It is a large fish, sometimes reaching a weight of 70 pounds, but that weight is very exceptional. It feeds on crabs, small fishes, sea-urchins and fish-eggs. The true turbot does not occur on the American coast. An entirely different flatfish, of smaller size, is incorrectly called turbot in the United States. See FLATFISH.

Turenne (*tū'rĕn'*), **Henri de la Tour D'Auvergne,** Viscount de, a great French soldier, was born at Sedan on Sept. 11, 1611. He was sent to Holland to study the art of war under an uncle of his, the celebrated Maurice of Nassau. He joined the French army, serving in Germany, where he relieved Mainz, besieged by the emperor's army. He then was attached to the Swedish army under Bernhard of Saxe-Weimar, where he captured several towns, and later defeated the Austrians and Spaniards at Casale and took Turin. After his conquest of Roussillon in 1642, he was made a marshal of France and given chief command on the Rhine, when he defeated the Bavarians at Rottwell, but was himself defeated at Marienthal. With Condé he avenged this defeat at Nördlingen. Turenne finished the war by conquering the electorate of Treves and (with the help of the Swedes), Bavaria, and conducted a successful campaign in Flanders. In the civil wars in France Condé and Turenne, the two greatest generals of the period, were on opposite sides, and Turenne with inferior forces was uniformly victorious, finally driving Condé from France. He then conquered much of the Spanish Netherlands. Louis XIV made him marshal-general of France, and only his Protestantism prevented his being appointed constable. Bossuet's celebrated *Exposition of Christian Doctrine* was written at the king's suggestion to effect the conversion of Turenne to Roman Catholicism, and aided by the king's solicitations was successful. In the campaign in Holland in 1672 he compelled the Elector of Brandenburg to beg for peace. His last campaign is disfigured by the devastation of the Palatinate, where he burned 30 towns. His desire to retire could not be gratified, as he was the only general that could successfully oppose Montecuculi, the great Austrian general, and for nearly half a year their strategy was the admiration of Europe. Having forced his antagonist to

a battle at Sasbach, Turenne was viewing the preparations for the attack, when he was killed by a stray ball on July 27, 1675. He was buried by order of the king at St. Denis, the place of the royal sepulchers. His monument was injured during the Revolution, but was finally placed beside that of Napoleon in the Hotel des Invalides, in Paris. See *Life* by Cockayne.

Turgenev or **Turgenieff** (*tōōr-gĕ'nyĕf*), **Ivan,** a Russian writer, was born at Orel on Oct. 28 (= Nov. 9), 1818. After studying at Moscow, St. Petersburg and Berlin, he obtained a position in the department of the interior at St. Petersburg. On account of his liberal ideas he was banished for a period, but was finally allowed to return to Russia. His home, however. for the most part was at Paris and at Baden. Many of his works were written in French, and have been translated into English and German. Among his best known novels are *Fathers and Sons*, *Liza*, *Smoke*, *Dimitri Rudin*, *Journal of a Useless Man* and *Virgin Soil.* He died on Sept. 3, 1883.

Tur'gor (in plants), the state of a cell when its wall is stretched by pressure of the water within it. Every active cell is normally turgid if adequately supplied with water, because the absorption of water by the protoplasm goes on until the elastic resistance of the wall balances the force (osmotic pressure) which determines the entrance of the water. The turgor varies from time to time and in different plants, but ordinarily equals three to six atmospheres, and in special conditions may rise much higher.

Turgot (*tŭr'gō'*), **Anne Robert Jacques,** a French statesman, was born at Paris, May 10, 1727. He was educated for the church, and was prior of the Sorbonne in 1749. In 1752 he studied law and became councilor in Parliament. He was given charge of the province of Limousin in 1761, where he introduced many reforms, as abolishing the method of mending the roads by the compulsory labor of the poor. He introduced the cultivation of the potato and other means of subsistence for the people. Under Louis XVI he was put in charge of the finances of the country, which were in a terrible state of disorder. His reforms included free trade in wheat in the interior of the kingdom, the doing away with the obligation to labor for the state and substituting a single tax on land for general taxes. He reduced the expenses of the government, and introduced exactness and faithfulness into the service. If his plans had been received with favor by the nobility and statesmen, France might have been spared the horrors of the Revolution. But the combination against him was so strong that the king yielded, and Turgot retired after 20 months of service. Among his writings are *Reflections upon the Formation and Distribution of Riches* and *Usury.* In writing on the American war, his views of the nature of colonies have since been generally adopted. His Latin inscription for the portrait of Franklin is celebrated: *Eripuit cælo fulmen, sceptrumque tyrannis.* (He snatched the thunderbolt from heaven, and the scepter from tyrants.) Turgot died at Paris, March 20, 1781. See *Life* by Say.

Turin (*tū'rĭn*) or **Torino,** a city in northern Italy, once the capital of the kingdom, is 75 miles southwest of Milan and on the Po. It is one of the handsomest cities in Europe, famed for beautiful squares, fine bridges and pleasant promenades. Among the squares are Piazza San Carlo, with a statue of Emmanuel Philibert of Savoy; Piazza Vittorio Emmanuele, the finest square in Europe; and Piazza Castello, in which are the royal palace, with its fine library and armory, the old palace of the dukes of Savoy, the military academy and the theater. There are a fine, five-arched bridge across the Po, begun by Napoleon with money obtained from the offerings at the cathedral and finished by the kings of Sardinia, and a beautiful single-arched one over the Dora. The cathedral, built in the 7th century, is the oldest church, and that of San Filippo the handsomest. The university, founded in 1404, has 68 teachers, 2,750 students and a large library, including that of Cavour, which was bequeathed to it. The Academy of Science has the finest Egyptian museum in Europe. The manufactures are woolen and silk goods, jewelry, paper, pottery, pianos and carriages. Turin was settled by the Taurini, a Ligurian tribe. Hannibal sacked the city after crossing the Alps. In 166 B. C. it became a Roman colony, and on the fall of the empire went to the Lombards. Charlemagne made it the residence of the duke of Susa; and in 1032 it became the possession of the house of Savoy. The French held it for 60 years from 1506 and in 1640, and in 1800 it was united to the French empire. In 1815 it was restored to Savoy, and was the capital of Sardinia until 1860 and of Italy until 1865. Population 371,000.

Turkestan (*tōōr'kĕs-tăn'*), (the country of the Turks), is a country in Central Asia, lying between the Russian dominions on the north and Persia and Afghanistan on the south. It is divided into western and eastern Turkestan by the table-land of Pamir (*q. v.*), called the Roof of the World, which is about 15,000 feet high. Western Turkestan, once called Independent Tartary, consists of the great plain of the Caspian and Aral Seas and the hilly districts on its eastern border, formed by the western branches of the Hindu Kush Mountains. Eastern Turkestan, also called Chinese Tartary, includes the country east of the table-land, reaching to the desert-plains of the Gobi. The Oxus, Jaxartes and Zerafshan

flow westward from the Pamir tableland, while the Yarkand and Kashgar are the most important rivers flowing eastward. The higher mountain-districts give fine pasturage in summer for flocks, and the upper valleys and plains are fertile and highly cultivated; but toward the Aral and Caspian Seas there are large regions of sandy and trackless wastes, many of them lower than the sea, where the wells are salt and both salt and sulphur are found. The portion of eastern Turkestan near the Pamir tableland is mountainous, and the center is a great plain, with fertile belts along the streams, but most of the country is a desert, except where it is irrigated. Gold, silver, iron, copper, niter, sulphur, asbestos, agate and jasper are found; while the field-products are cotton, rice, wheat, hemp, flax, barley, corn, tobacco and most of the common fruits. The great article of export is cattle. Manufactures of silk and cotton goods, sabers and knives exist. In western Turkestan the people are Turks or Tartars and Tajiks or Aryans. They also are divided into the settled population and the nomad or wandering tribes. The religion is Mohammedanism. The people are jealous of foreigners, so that the country has been very difficult of access by Europeans. The inhabitants of eastern Turkestan are varied, the Turanian element being the most prominent. The villages are a collection of walled inclosures, surrounding houses and gardens.

Turkestan has had an important part in Asiatic history. Most of the western part belonged to the Persian empire, and many of its large cities were built by the Persians. It went with Persia into the hands of the Macedonians, part of it becoming a Greek province. In the 8th century the Arabs had possession, and it was finally overrun by the Mongol hordes of Genghis Khan (*q. v.*). Under Timur (*q. v.*) it was the center of a great empire, stretching from Moscow to the Ganges and from the Hellespont to China; its cities were adorned by the spoils of victory; and colonies of learned men and skilled artisans were brought to the country. The empire split into fragments on the death of Timur's youngest son, and various independent states were formed out of what now is Turkestan. In 1792 the present Uzbeg dynasty obtained the throne. The later history of Turkestan is a series of wars between Bokhara, Khiva and Khokan; of raids of the Turkomans along the Persian border; and of the progress of Russian conquest from the north and west. The Pamir tableland separates the acquisitions of Russia and England in Asia, and both countries have been contending for Turkestan, but so far Russia has succeeded in obtaining control of the larger part of the country, thus forming the Russian general government and provinces of Turkestan, with an area of 400,770 square miles and a population of 6,250,000. Its capital is Tashkend (*q. v.*). Chinese or Eastern Turkestan belongs administratively to Sin-Kiang, the area being 550,340 square miles and the population 1,200,000.

Tur'key, a large bird related to the pheasants and originally inhabiting the New World. There are three species known: the North American, the Mexican and the Central American bird. The Mexican turkey was domesticated by the Indians before the discovery of Mexico by the European, and is the original from which the domesticated birds are descended. It was introduced into France and England in the 16th century, and is imported all over the world. The turkey of Central America excels all others in variety and splendor of plumage, which combines metallic green, blue, black, yellow and red. It lives in the open forest and the open country, rather than in the deep forests, like the wild turkey of North America. The male has no tuft on the neck. The common wild turkey of North America ranges from southern Canada to Florida and Mexico, but has been so persistently hunted that it is found only in remote swamp and woodland or mountain region far from haunts of man. It is about four feet long, being the largest game-bird; has plumage of a metallic bronze; the bill and head are red, the head and neck bare; from the center of the breast of the male hangs a beard-like tuft. The hen is a devoted mother, but her young have a serious struggle for existence, snakes, hawks and other enemies disturbing and destroying them.

Turkey-Buzzard, a bird belonging to the group of the New-World vultures. It abounds in the warmer parts of North and South America, and ranges throughout the United States, except in New England. This bird is about 27 to 30 inches long. It has a dark plumage, with a violet and greenish luster on the upper parts. The bill is white, and the head and upper parts of the neck, which are destitute of feathers, are reddish. It feeds on carrion. See BUZZARD and VULTURE.

Turkey up to the Balkan war (*q. v.*) consisted of those countries in Europe, Asia and Africa under the control of the sultan, though it is usually limited to Turkey in Europe and Turkey in Asia, called Turkey proper. Including all subject states, it covered 1,565,000 square miles and had a population of 35,400,000. Turkey in Europe had been reduced to a territory stretching from the Black Sea to the Adriatic, from the Ægean Sea and Greece on the south to the Balkan Mountains and north of them to about 43° north latitude, covering 65,350 square miles, with a population of 6,130,200, made up mainly of Turks, Greeks, Bulgarians and Albanians. Turkey in Asia covers 693,610

square miles, with a population of 17,683,500, consisting of some 4,000,000 Arabs, besides Turks, Greeks, Kurds, Circassians, Armenians and Jews. It stretches from the Black Sea to Arabia and the Mediterranean and from the Ægean to Persia. A part of Arabia, Samos, Tripoli (including Benghazi) and Egypt are Turkish dependencies.

Surface. Turkey proper has a great extent of coast, broken by bays, gulfs and islands, with many fine harbors. The Dead Sea in Palestine and Lake Van in Armenia are among its many large salt-lakes. The Taurus and Anti-Taurus ranges and the Syrian mountains are among its principal ranges, while a large part of what before the Balkan war was European Turkey is mountainous, and in Asiatic Turkey elevated plains abound.

Climate. The winters are cold in the mountainous districts, but warm in the sheltered valleys, and the summers very hot, especially in Syria and Asia Minor. Very little rain falls from April to September, and many plains need irrigation to be cultivated. The highest peaks reach the region of perpetual snow.

Resources. The minerals are copper, lead, alum, silver, emery, niter, iron and coal, though many of the mineral resources are still undeveloped. In European Turkey the rose is extensively cultivated, and the attar is an article of commerce. The trees of Asiatic Turkey — the cedar, cyprus, sycamore, mulberry, olive, fig, citron, orange and pomegranate — differ from the fir, pine, almond, walnut, chestnut, peach and plum-trees most abundant in European Turkey. There are 250 species of birds and many wild animals. It is a rich country with great resources, but still undeveloped.

Government and Religion. The religion of Turkey is Islam, and the Koran is the law. The sultan or head of the government is looked upon as the successor of Mahomet; and his will is absolute, so far as it is not in opposition to the Koran or to the Multeka, the writings of Mahomet and his immediate successors. There are 2,120 mosques in the empire, of which 379 are in Constantinople alone. Four wives are allowed by the Koran, but most of the people are too poor to support more than one. The Christians of Turkey, found in the Greek, Armenian, Protestant and Roman churches, and the Jews are all tolerated as independent sects by the government, though often bitterly opposed to each other. Turkey is governed by the sultan, with two chief officers appointed by him, the grand vizier, the head of temporal affairs, and the Sheik-ul-Islam, the head of the church. There is a council, which corresponds to the British cabinet. The divisions of the country are called *vilayets* (governments), *sanjaks* (provinces) and *kazas* (districts). The present sultan is Mehmed V. ninth of the house of Othman, the twenty-ninth sultan since the conquest of Constantinople (1453). All children born in the royal harem are considered heirs to the throne, whether the children of free women or of slaves, and the crown passes to the male descendants of Othman according to age. The standing army numbers 350,000 men, and military service is required of all able-bodied Mohammedans, while all others pay an exemption-tax. The navy has about 50 vessels, including 18 iron-clad ships of inferior class.

Education. The Koran and the Multeka encourage public education, so that public schools have long been established in most of the prominent towns, while colleges with public libraries are attached to the principal mosques. At Constantinople are the Great National school (Greek), founded in 1870, a university founded in 1900, an imperial art-school, law, military and engineering schools and a naval school on an island in the Sea of Marmora. The Christian communities have good institutions, among them Robert College at Constantinople and the Syrian Protestant College at Beirut.

History. The Ottoman empire is the successor of the Byzantine empire (*q. v.*), and was founded by Othman or Osman who conquered Nicæa and other districts, and succeeded to the power of the Seljuk sultans. Adrianople was taken in 1361 by his grandson. Mohammed II (*q. v.*) after a siege of 53 days took Constantinople and ended the Byzantine kingdom on May 29, 1453. Solyman the Magnificent (*q. v.*) continued the conquests of his predecessors and brought Turkey to its highest military power. During his son's reign the Turks lost the battle of Lepanto. Under his successors the Turkish power was reduced by such generals as Montecuculi, Sobieski and Prince Eugene. (See JOHN II OF POLAND and EUGENE). The loss of the Crimea and the regions north of the Black Sea, the conquest of Egypt by Bonaparte and its resulting war with France increased the troubles of the country. The revolt of the janizaries ended with a terrible struggle and massacre in 1826. At Navarino, Oct. 20, 1827, the Turkish fleet was destroyed, and in 1829 Greece became independent. Between 1840 and 1867, exclusive, Egypt (*q. v.*) became practically independent. In 1840 Turkey was admitted into the political system of European states, and since that time her power has been strengthened by the alliance of other nations, as by England, France and Sardinia in 1854 in the Crimean War against Russia and by the French and English in the conflicts between the Druses and Maronites at Damascus and in the Lebanon (*q. v.*). In 1875 Bosnia (*q. v.*) and Herzegovina revolted against Turkish misrule, and a year later there were uprisings in Bulgaria (*q. v.*),

followed by horrible massacres of men, women and children by Turkish soldiers. These atrocities aroused all Europe. On account of them England could not now befriend Turkey, and Russia, having secured the neutrality of Austria by giving her permission to occupy Bosnia and Herzegovina on certain conditions, declared war against Turkey in 1877. After a bloody contest Plevna, the Turkish stronghold, fell, and the Russo-Turkish War was ended by the peace of 1878. This changed the map of European Turkey greatly, Rumania, Montenegro and Servia becoming independent. Bulgaria north of the Balkans was erected into a principality under Turkish protection. Southern Bulgaria, called East Rumelia, was left to Turkey, but in 1885 it was united to northern Bulgaria, while Bosnia and Herzegovina came under Austrian control. A portion of Armenia, including Batum, was taken by Russia. Beginning with 1895, the Armenians were subjected to the most terrible oppression by their Turkish masters, who feared an uprising to revive the ancient Armenian monarchy and were also determined to crush the Armenian faith. These oppressive measures were resisted by their victims, who were at once punished by torture and death. In 1895 and 1896 systematic massacres of the Armenians were carried out by the Turks, in which over 2,500 villages were obliterated, about 21,000 people murdered, and thousands left starving and shelterless. It is believed that the sultan had tacitly consented to the extermination of his Armenian subjects, which would doubtless have followed, save for the warning interposition of the European powers, compelled by the outraged public opinion of Christendom. In 1896–7 Crete (*q. v.*) revolted, Greece attacking Turkey but being defeated, and Crete gained self-government, though under Turkish control. Macedonia revolted in 1903, but was unsuccessful in securing the sorely needed reforms. In 1908, Austria annexed Bosnia and Herzegovina, Bulgaria proclaimed absolute independence, and Crete demanded to be incorporated politically with Greece. On July 24, 1908, the sultan was forced by Turkish reformers to grant a constitutional government, and later to abdicate in favor of his brother, who was made Mehmed V. Owing to disorders in Tripoli and ill treatment, as she claimed, of Italian subjects, Italy declared war on Turkey Sept. 11, 1911, and, as part of the terms of peace concluded Oct. 18, 1912, practically annexed the Tripolian province of Libya. Then came the Balkan War (*q. v.*) which drove Turkey out of Europe with the exception of Constantinople, Adrianople and adjoining territory.

Turks, a race of people belonging to the Turanian family, who appeared first in Asia among the Tartar tribes. In the 6th century around Turkestan grew up a Turkish empire, which was overthrown by another Turkish tribe, the Uigurs, the first Turks to possess a written language. They were driven westward by the Chinese, with whom they had been contending for centuries, and their kingdom in Central Asia was entirely overthrown by Genghis Khan (*q. v.*). But they had already established themselves in the west of Asia, where the possessions of the Seljuks, another tribe of Turks, reached from Persia to India between the 10th and 12th centuries. The Ottoman empire was founded in the 14th century by Othman, and the present inhabiants of Turkey are called Osmanli or Ottoman Turks. The Turkomans ("like the Turks") are the descendants of the old Seljuks, and are found in Turkestan. The Ottoman Turks, found in the Turkish empire, are more like Europeans than the other Turkish tribes, which have the broad face, high cheek-bones and yellow skin of the Mongolians. The different tribes speak nearly the same language, and usually are Mohammedans, though the Turks on the borders of China are Buddhists, and those of Siberia, Greek Christians. See SELJUKS and TURANIANS.

Turks and Cai'cos Islands, two groups of British islands, over 30 in all, southeast of the Bahamas and under the government of Jamaica. The largest, Grand Caicos, covers 112 square miles; and Grand Turk, 14 miles square, is the seat of government, in telegraphic communication with Jamaica and Bermuda, and has 1,883 inhabitants. The only important industry is salt-raking, about 1,800,000 bushels being exported annually. Sponge and fibre industries are also carried on. Population 5,287.

Tur'meric, a name given to the roots of a plant of the ginger family. The roots or root-stocks are yellow, marked with wrinkles, and a darker yellow or reddish brown inside, and when chewed make a yellow stain; they smell like ginger, and have a somewhat similar taste. They are used somewhat in dyeing, in coloring varnishes and in curry-powder and pickles. Paper colored by turmeric is extensively used by chemists as a test for alkalies and for boric acid.

Turn'er, Rt. Hon. Sir **George,** P. C., G. C. M. G., formerly premier and treasurer of Victoria and treasurer in the Barton (Australian commonwealth) cabinet, was born at Melbourne, Victoria, in 1851, and educated at Melbourne University. In 1887 he entered politics. He has held office in a number of administrations, including the ministership of customs, of defense and of health, and has been solicitor-general. He has been a member of the Australian National Federation Convention and chairman and president of the Federal Council.

Turner, Joseph Mallord William, an English painter, was born at London on April 23, 1775. His first art-work was

coloring prints for an engraver. He was indebted to a Dr. Monro for encouragement in his early work by giving him the opportunity to see his fine collection of water-colors and by buying his sketches. He studied at the Royal Academy, where he exhibited his pictures, and in 1802 was elected a member, being already recognized as the first landscape-painter of his time. His style was afterward changed by travel in Europe, and in the last few years of his life, as some physicians believe, by a change in his eyes, which cast the blue mist so characteristic of his later works. He contributed 259 pictures to the Royal Academy, and over 19,000 drawings and sketches were mounted and arranged by Ruskin. His illustrations of the poems of Rogers, Byron, Scott and other authors are well-known. Among his paintings are *Dutch Boats in a Gale, Falls of the Clyde, Sun Rising through a Mist, The Fighting Téméraire, Bay of Baiæ* and *Childe Harold or Modern Italy.* His most famous drawings are *Rivers of France, Rivers of England, Scenery of the Southern Coast* etc. They were carefully prepared by him for engraving, and all his pictures were engraved during his lifetime. Ruskin in *Modern Painters* did much to raise Turner to the high position he holds among English painters. He was very eccentric, traveling alone and hiding himself for months under an assumed name, and had a strong passion for money. He died on Dec. 19, 1851, at Chelsea, leaving to the nation his collection of pictures, which have been placed in the National Gallery of London. His large fortune was left to found a home for needy artists, but some defect in the will prevented the carrying out of his wishes. He was buried beside Sir Joshua Reynolds in St. Paul's. See *Life* by Thornbury; *Life* by Hamerton; and *Modern Painters* by Ruskin.

Turner, Sharon, an English historian, was born at London, Sept. 24, 1768. He was attorney by profession, but continued his literary studies, and published a *History of the Anglo-Saxons,* in three volumes. This work was the result of years of patient collection of materials and research, and gave its author a permanent place in English literature. His other works are a *History of England from the Earliest Period to the Death of Elizabeth* and a *Sacred History of the World as Displayed in the Creation.* He died at London, Feb. 13, 1847.

Turn-Verein (*toorn-fĕr-ine'*), from the German *turn* meaning gymnastics and *verein* meaning society, is a German society for gymnastic exercises, instituted in 1811 by Friedrich Ludwig Jahn, known as *Turnvater Jahn.* Jahn realized the important influence of gymnastics upon health and physical fitness, especially in the training of soldiers; and, being a soldier himself and inordinately fired with the spirit of war and patriotism, he conceived the idea of forming a society which should prepare German youth physically for excellent citizenship. In 1811 a sand-field was secured near Berlin, the edge of what now is the great exercising-ground of the Berlin garrison. Here began the gymnastic exercises which now form part of the curriculum in every German school. A monument of Jahn has been erected here, the stones of which were sent from far-away countries. Knowing the German fondness for song, Jahn sought to establish an intimate relation between singing in unison and outdoor exercises. Singing was then made a part of the gymnastic exercises on the march to and from the field, and Jahn took great pains to select patriotic and military songs. On this gymnastic field he was training the minute-men of the German Revolution. The *turn-verein* now is a great factor in German education. A university union was founded in Berlin in 1860; and was immediately imitated by other universities. An association of such unions was founded in 1872. The two great associations of *turn-vereine* in Germany include respectively 26 universities (the older including Berlin, Leipzig and Gratz), and 16 universities and high schools (including Jena, Freiburg, München and Aachen.)

Tur'pentine, a gum or resin which is found in various species of pine, and some other trees. American or common turpentine is obtained from the long-leaved pine, and is brought in the largest quantities from North Carolina. Venice turpentine, which is considered the best kind, is from the larch-tree. German turpentine comes from the Scotch fir, Strassburg turpentine from the silver fir and Canada turpentine from the balsam or balm-of-Gilead fir. Turpentine is obtained by making a cut in the tree and catching the sap, which looks much like honey. The oil of turpentine is made from this sap by distilling, and the hard part that is left is the common yellow resin, used in making soap, etc. Turpentine hardens in the air, burns easily, and can be dissolved by alcohol or ether. The oil of turpentine is used in medicine and in making varnishes and paints. The name comes from the terebinth tree, from which the Greeks obtained it. See RESIN.

Turquoise (*tur-koiz'*), one of the precious stones, is a mineral, found mostly in Persia. It is a phosphate of alumina colored by copper. It is hard and of a greenish-blue color, the finest blue being the most valuable. It is used in the east for ornamenting swords, charms and girdles, and is thought to protect its owner against disease. The finest specimens are supposed to belong to the shah of Persia, as only inferior varieties are allowed to be sent out of the kingdom.

Tur'tle, a general name for all reptiles having the body inclosed between an upper shield (*carapax*) and a lower shield (*plastron*).

GREEN TURTLE ON WHARF AT KEY WEST

Names like tortoise and terrapin apply to particular kinds of turtles, but the general name embraces the green turtle, famous for making soups, the loggerhead turtle, soft-shelled turtle, snapping-turtle, pond-turtle, terrapin, tortoise and others. They inhabit both fresh and salt water, and some forms are terrestrial. Many kinds are sought for food.

Unlike tortoises and terrapins which have feet adapted for walking on land, the true turtles or sea-turtles have their limbs in the form of flippers or paddles, suited to their aquatic life and enabling them to swim with great swiftness. Their bodies also are so depressed or flattened as to facilitate their progress through the water. The head is so placed upon the neck as to permit the nostrils to be raised above the surface of the water for breathing, and the nostrils can be closed by a fleshy valve. The turtles live in the sea and come to the shore only for breeding. Their eggs are soft, differing in this respect from those of the tortoise and terrapin. The best known species is the green turtle, famous as the source of the turtle-soup so widely prized. It is a vegetarian, feeding upon seaweed. It reaches a length of 42 inches and its shell is olive or brown with yellowish spots. The hawksbill-turtle feeds upon animal substances and is not itself used for food, but is prized for the mottled shields of its shell which furnish the tortoise-shell of commerce. The loggerhead-turtle is known by its enormous head and hooked beak. It is the largest species, and readily crushes a conch-shell in its strong beak.

Turtles never leave the sea except to lay eggs. They scramble along clumsily, and if turned on their backs they are helpless. Turtles generally come ashore on moonlight nights and often utter a loud hissing noise. Audubon writes that when the female turtle is once landed she "proceeds to form a hole in the sand by removing it from under her body with her hind flippers. The hole is dug to the depth of 18 inches or two feet. The eggs are then dropped one by one and disposed in regular layers to the number of 150 or sometimes nearly 200. She now scratches back the loose sand and so levels and smoothes the surface that few persons on seeing the spot could imagine that anything had been done to it. This accomplished to her mind, she retreats to the water with all possible dispatch, leaving the hatching of the eggs to the heat of the sand." The eggs of turtles are prized as food. Large numbers of turtles are caught by turning them on their backs when on land. Sometimes they are harpooned; sometimes they are pursued in shallow water by men in canoe or boat, and when overtaken, a man springs upon the turtle's back and clings to it until it is tired out and secured.

Turtledove, an Old-World dove represented by 25 or 30 species. The common turtledove, so abundant in Europe, is both wild and tamed. It is noted for its affectionate and peaceful disposition. It is a migratory pigeon of moderate size. Like other members of the group, it feeds on seeds and various kinds of grain and makes a platform of twigs as a nest. The mourning dove of the United States is also called the turtledove. It belongs, however, to a different genus from the European dove. It is about 13 inches long, including its long tail. It is brownish olive, glossed with blue and wine colors. The plumage shows metallic reflections. It feeds upon the ground. This bird is widely known, on account of its long mournful note, even to those who have not seen it. See DOVE and PIGEON.

Tuscaloo'sa, Ala., county-seat of Tuscaloosa County, is on Black Warrior River, 90 miles northwest of Montgomery. The insane asylum, with fine buildings and grounds, a college for women and the state university are situated here. The university's endowment includes 500 acres and $300,000 from lands granted by Congress. The buildings were burned in 1865 by the Federal troops, but there are four new buildings, with Clark Hall, containing the library. Tuscaloosa is in the cotton-planting and the mineral region of Alabama, which makes it the center of a large trade. It has flour-mills, cotton, shoe and leather factories. The name comes from the Indian chief, Tuscaloosa (Black Warrior), who fought with De Soto. Population 8,407.

Tus'cany, a division of central Italy, formerly a grand-duchy. It lies south and west of the Apennines, on the Mediterranean, covering 9,304 square miles. The northern part is mountainous, the remainder hilly and undulating, except the coasts, which are flat and marshy. The principal rivers are the Arno, Cecina and Ambrone, which flow into the Mediterranean. The main crops are corn, wheat, rye and barley; cattle, sheep and mules are raised in great numbers; olive-oil, wine, woolen, silk and straw-goods are manufactured. Leghorn is the principal seaport, and Florence (*q. v.*), the chief city, for centuries was the center of Italian literature and art, and is famous for the beauty of its situation and environs and for its fine art-collections. Tuscany was a part of ancient Etruria (*q. v.*). With the fall of the Roman empire it went to the Lombards, and was governed by counts, under Charlemagne and other emperors, until the latter part of the 12th century. Florence, Pisa, Siena and Lucca were the principal of the little states into which Tuscany was divided during the struggles of the next centuries. Modern Tuscany was formed in 1569, when Cosimo de Medici became grand-duke of Tuscany. Napoleon formed the kingdom of Etruria in 1801, and in 1808 made his

sister, Elisa, grand-duchess of Tuscany. In 1860 it became a part of the kingdom of Italy. Population 2,694,453. See *Tuscany* by Mrs. Trollope.

Tus'caro'ras, a tribe of American Indians, one of the Six Nations of the Iroquois family, found in North Carolina at its settlement. After difficulties with the whites, in which many of the Indians were killed or taken prisoners, a part of the tribe fled to New York, where they settled on Lake Oneida, and still have a reservation in that state. In 1829 North Carolina bought the lands still held in that state by the Tuscaroras. The name means a shirt-wearer.

Tweed, the most famous river in Scotland, rises in Peebleshire, flows for about 20 miles northeast and then in an easterly direction, emptying into the North Sea at Berwick in England. It is 95 miles long, but navigable only a few miles from its mouth. It owes its fame to beautiful scenery and historical associations. Crossing the heart of the Borders between England and Scotland, it has been the scene of many a deadly struggle, and its name is frequent in ballad and story.

Tweed, William Marcy, an American politician, was born at New York, April 3, 1823. He held the different offices of alderman, congressman, supervisor of the city of New York, school and street commissioner and state senator. While commissioner of public works in 1870, he and his followers, constituting the famous Tweed Ring, used large amounts of public funds for their own purposes. After several trials Tweed was convicted of fraud and sentenced to 12 years' imprisonment and the payment of $12,550 as a fine. He was confined at Blackwell's Island, but his imprisonment was declared illegal by the court of appeals. Several other suits had been brought against him, and he was again imprisoned for want of the $3,000,000 of bail required. He escaped to Spain, but was recaptured, and died in jail in New York City on April 12, 1878.

Twee'die, Hon. L. J., was born at Chatham, New Brunswick, in 1849. Called to the bar in 1871 and elected to the legislature in 1874, he was surveyor-general in 1890, and became provincial secretary in the Mitchell administration and in the Emerson government. He became premier and provincial secretary in 1900, and was appointed lieutenant-governor of New Brunswick in 1907.

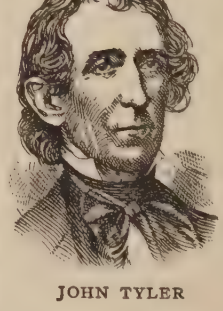
Twickenham (*twik'en-am*), a village in Middlesex, England, on the Thames opposite Richmond. It is known as the residence of Pope, whose grotto is still to be seen and whose monument is in the parish church. Strawberry Hill, famous as the home of Walpole, is near by, and the Orleans house, used by Louis Philippe while in England and still belonging to his family, is in the town. Population 20,991.

Twi'light is the faint light before sunrise and after sunset, which is produced by the reflection by the atmosphere of the sun's rays when it is still below the horizon. If we had no atmosphere, we should have no light until the exact moment when the sun would rise and no light after the sun had set. The sun must be approximately 18° below the horizon at any place before the twilight will entirely cease; so in the polar region where the sun is nearer the horizon than 18° there will be twilight all night, or rather there will be no complete night. Just what there is in the earth's atmosphere that reflects the sunlight is yet unknown. It may be dust-particles; it may be minute crystals of ice; it may be pure air itself.

Twi'ner, a plant which climbs by coiling its body in an ascending spiral about a support, as the morning-glory or the hop-vine. In their younger parts twiners are sensitive to contact, so that when they touch a support they curve sharply about it. The twining habit, like the climbing habit in general, is most extensively developed in the tropics. See CLIMBING-PLANTS.

Ty'ler, Tex., a town, the seat of Smith County, on the International and Great Northern and St. Louis Southwestern railways, about 100 miles east-southeast of Dallas. Its institutions include Tyler College, Texas College (for colored youth), a public library, a conservatory of music, the Federal court, postoffice, court of criminal-appeals buildings and a railroad hospital. It also has two public parks (Lakewood and Bellevue). Its trade consists in the shipment of live stock, cotton, hay and varied kinds of fruit and vegetables. It has cotton-gins, brick-kilns, a pottery, cotton-seed-oil mills, a fruit-and-vegetable and a box-and-crate factory. The town was settled in 1846, incorporated the same year, and received its present charter in 1875. Population 10,400.

Tyler, John, tenth president of the United States, was born at Greenway, Charles City County, Va., March 29, 1790. He graduated at William and Mary College in 1807, studied law, and had a large practice soon after he was admitted to the bar. He was elected five times to the state legislature and three times to Congress. He sympathized with the states' rights party, and opposed the United States bank, protection and all limitations of slavery. In 1825 he was chosen governor of Virginia, and in 1827 he became United States senator and was again elected in 1833. From this time he acted with the Whig party,



JOHN TYLER

being an active partisan of Henry Clay, and in 1840 was by that party elected vice-president of the United States, with General Harrison as president. The death of President Harrison, a month after his inauguration, made Tyler president in 1841. His administration, at first favorable to the Whigs, was soon displeasing to them. He vetoed the bill for a United States Bank, at that time a favorite project of the party. Several members of the cabinet resigned, and finally John C. Calhoun, the great Democratic statesman, was made secretary of state. The annexation of Texas in 1845 and the passing of a protective tariff law in 1842 were among the important acts of Tyler's administration. In 1861 he was president of the peace convention which met at Washington to effect a compromise between the north and the south. He afterwards joined the Confederate cause, and was a member of the Confederate Congress at his death, which occurred at Richmond, Va., Jan. 17, 1862.

Tyler, Moses Coit, an American *littèrateur* and professor of American history at Cornell University since 1881, was born at Griswold, Conn., Aug. 2, 1835, and graduated at Yale in 1853. From 1867 to 1881 he was professor of English at the University of Michigan, and for a time was literary editor of *The Christian Union*. In 1881 he accepted the chair of American history at Cornell. He wrote a *Manual of English Literature*, a *History of American Literature during the Colonial Period (1606-1765)*, *The Literary History of the American Revolution*; *Glimpses of England* and a *Life of Patrick Henry*. His works possess literary charm as well as thorough scholarship. He died on Dec. 28, 1900.

Tyler, William Seymour, an American scholar, was born at Hartford, Penn., Sept. 2, 1810. The gift of a Greek grammar by a young minister started the boy on his career as a scholar and teacher. He graduated at Amherst College, and studied theology, but accepted the professorship of Latin and Greek in Amherst College in 1836. Besides his work in the college for more than 50 years, where he became celebrated as a teacher of languages, he is well-known from his editions of Greek authors, as *The Germania and Agricola* of Tacitus, Plato's *Apology* and *Crito* and Demosthenes' *De Corona;* and from *The Theology of the Greek Poets* and *The History of Amherst College*.

Tylor, Edward B., D. C. L., a distinguished English scholar, and professor of anthropology at the University of Oxford, was born at London, Oct. 2, 1832, and educated at the Friends' School, Grove House, Twickenham. In 1856 he took a scientific journey through Mexico, and has written *Anahuac, Mexico and the Mexicans; Researches into the Early History of Mankind; Primitive Culture;* and *Anthropology*.

Tyndale, William. See TINDALE, WILLIAM.

Tyn'dall, John, an eminent British scientist, was born at Leighlin Bridge, Carlow, Ireland, Aug. 21, 1820; and died in Surrey, England, Dec. 4, 1893. He was educated in the public schools until 19, when he entered the employ of the ordnance survey. After a short teaching experience he went to the University of Marburg in 1848, where he spent two years and took his doctor's degree. In 1851 he went to Berlin, where he made the valuable acquaintance of Magnus, Clausius, Wiedemann and others. Returning to London in 1852, he was elected fellow of the Royal Society, and in the year following was appointed professor of natural philosophy in the Royal Institution, succeeding Faraday, a position which he held until 1887, when he was succeeded by Lord Rayleigh. Tyndall's earliest investigations were made at Marburg on *The Magneto-Optic Properties of Crystals*. In 1859 he began an important study of *Radiant Heat*, resulting in a classical volume in 1872. His investigations of glacier motion were reported to the Royal Society in 1856, and later recorded in interesting popular volumes. As a skillful and brilliant lecturer on science he has, perhaps, never been surpassed. Every one should read his *Heat as a Mode of Motion* and his *Forms of Water*.

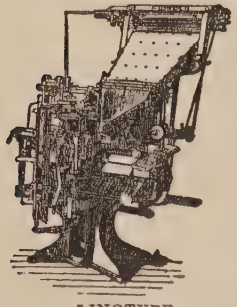
PROFESSOR TYNDALL

Tyng, Stephen Higginson, an American clergyman, was born at Newburyport, Mass., March 1, 1800. He was a graduate of Harvard College and a prominent clergyman of the Episcopal church, successively occupying parishes at Georgetown, D. C., Philadelphia and New York City. Besides his great influence in the pulpit and in church work, he was editor for some time of the *Episcopal Recorder* and *Protestant Churchman*, and wrote *Lectures on the Law and the Gospel; Christ Is All; The Captive Orphan; Esther, Queen of Persia; The Prayer-Book Illustrated by the Bible; Forty Years' Experience in Sunday-Schools;* and *The Feast Enjoyed*. He died on Sept. 4, 1885.

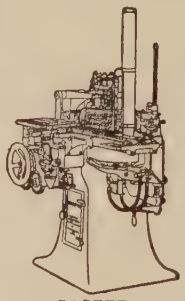
Type, the name of the metal letters used in printing. They are usually made of an alloy called type-metal, made of lead, antimony and tin, copper sometimes being added. The antimony gives hardness and the tin toughness to the soft lead, which is the principal metal used. A copper-face is sometimes put on the type by the electrotype battery, which makes it last longer. Types were formerly made by hand, but now type-casting machines do the work.

The types must be made with absolute accuracy in order to fit so exactly when placed together that they will form a solid body. To do this they are made in molds, into which the hot metal is injected. The letter to be made is cut on the end of a bar of soft steel, and then pressed into a piece of copper by the blow of a hammer, and the copper impression is fitted into the end of the mold and the metal poured in it, filling up the impression of the letter and the rest of the mold. Types are all of the same height, but of different widths according to the letter. A full set of types is called a font or fount, and has the letters in different proportions, as 60 of e, 45 of t and 40 of a, i, o, u etc. Large and small capitals, large and small italics, small letters, figures and punctuation-marks are found in a font. Types are of different sizes, called by printers nonpareil or six-point, minion or seven-point, brevier or eight-point, bourgeois or nine-point, long primer or ten-point, pica or twelve-point etc. Some of the names came from the first maker of the type, and others from the first book printed with that particular kind of type, as brevier from breviary and pica from the service of the mass called pica or pic. According to an inscription on a tablet to his memory in Mainz, Gutenberg is credited with making the first printing-letters in brass, in place of the wooden types first used in printing. The first type-founder in America was Christopher Saur, who cast the type used by him in printing a German Bible about 1735. A page of a daily newspaper will sometimes require 150,000 types.

Type'setting-Machines. The closing years of the last century contributed much to the development and advancement of the art of printing. To substitute machines for the slow, laborious and expensive process of typesetting by hand had been the aim and ambition of a number of inventors. The United States patent-office alone has recorded upwards of 500 patents for typesetting and distributing machines with improvements; but the majority of these inventions have been noted more for their ingenuity than their practical use. Nearly all of the typesetting-machines were invented with the object of using the regular hand-type. A few machines of this class are still in use in America and England. Two of the most successful machines are the linotype and the monotype, both machines making their own type. The linotype (*q.v.*) was constructed by Otto Mergenthaler of Baltimore, Md., and is largely used by the daily newspapers throughout the world. This machine casts a solid line of type (*q. v.*) from a group of matrices or molds that bear the impress of the letters. These are dislodged from their respective channel receptacles at the top of the machine and assembled by the operator in the form of words spaced out to the desired length of line; the operator simply fingering a keyboard, somewhat as in the typewriter. The monotype

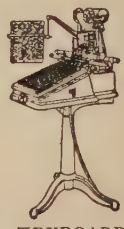


LINOTYPE



CASTER

MONOTYPE AND KEYBOARD



was invented by Albert Lanston of Washington, D. C. This machine casts each type and space separately, but in lines of words spaced out to the length of line desired. This is accomplished by a machine called the caster, the mechanism of which is regulated by a long strip of paper previously perforated by the operator on the keyboard. The production of the monotype being movable types, the machine is largely used in book-work and job-work, as the matter is practically the same as type set by hand and can be manipulated as such. The linotype and monotype machines have been improved so greatly in recent years that any kind of printed matter can be handled by them as well as or better than by hand; certainly much more rapidly.

In combination with the improvements and inventions in other branches of the printing-trade, as printing-presses, folding-machines and bookbinding-machinery, the use of typesetting-machines has enabled the manufacturer to reduce the price of all classes of printed books and magazines, thus bringing literature of every description within the reach of all.

Perhaps there is no trade or profession that is a better example of the vast advantages accruing to mankind from the usefulness and utility of labor-saving machinery and new inventions. Instead of displacing the workmen, the tendency in the printing-trade has been to increase the number with every new device invented. To-day there are more men and women employed in the manufacture of printed matter than ever before, irrespective of the great number employed in making machinery for their use. W. H. Aitken.

Type'writers, machines for writing by movable types instead of the pen. In 1714

a patent was granted in England for a writing-machine, and one was invented in France about 1784. The first writing-machine patented in America was the Thurber in 1843, which worked too slowly to be of general use. Other machines followed, each introducing improvements and new principles, until in 1873 the Remington was put into practical use. It was the result of experiments made by two printers, Sholes and Souli, whose attention was called to an article in *The Scientific American* describing a writing-machine which had been invented by John Pratt of Alabama. The first machine was finished in 1867, and was used for letter-writing. One of these letters brought the new enterprise a friend, Mr. Densmore of Pennsylvania, who joined with Sholes in perfecting the machine, until in 1873 it passed into the hands of the firm of Remington and Sons, Ilion, N. Y. It was first used by professional men. Its great advantages for business houses were not thought of until 1882, since which time it has been almost universally adopted, and many different kinds have been introduced. The types are placed on arms or bars of steel, each marked with a letter, which are moved by the fingers of the operator as are the notes of a piano. The paper is carried through by rollers, and moved one space with each impression of a letter. The use of the typewriter instead of the pen is estimated to save 40 minutes an hour or over five hours in a day. It will write 13 *letters* a second, some operators writing more than a hundred *words* a minute. Typewriting has become a profession, and there are free classes of instruction in many public institutions in the United States.

Typhoon. See STORMS.

Tyre (*tīr*), a city of ancient Phœnicia, on the Mediterranean. There were two towns of Tyre, one on the mainland of modern Syria and the other on an island opposite. It was in a fertile region, with magnificent scenery, and was a rich city in the days of Solomon, when Hiram, its king, furnished him with cedar-trees, fir-trees and gold. It was a naval city at that time also, as it is recorded that Hiram sent to Solomon "shipmen that had knowledge of the sea," and its harbors were among the finest of the period. Carthage (*q. v.*) was founded by the people of Tyre about 813 B. C., the new colony seeming to have so weakened the old city that it disappeared from history until Shalmaneser (or Sargon according to some writers), king of Assyria, conquered it after a long siege, and Nebuchadrezzar after a 13 years' siege by water and by land reduced it only to partial submission, leaving its ruler on the throne and its wealth untouched. The city fell before Alexander the Great in 332 B. C., who put in a new colony, under whom the city soon regained its prosperity. When under the Roman power, Tyre was given to Cleopatra by Antony. In the 7th century it came into the hands of the Saracens, until taken by the crusaders. Its wealth, made by its trade and manufactures, especially that of the renowned Tyrian purple dye, made it a prosperous city until 1516, when the newly discovered route to Asia by the Cape of Good Hope ended its commerce. Its site is occupied by an unimportant town called Sur, with about 5,000 inhabitants, under the Turkish government of Beirût. Many of the ruins of ancient Tyre have been covered by the sea, but tombs are found cut in the rocks and the remains of a Christian cathedral built in 324.

Tyrol or **Tirol** (*tĭ-rōl'*), an Austrian province in the western part of the empire, lies north of Italy and east of Switzerland. It covers 11,324 square miles, and is divided into three large valleys separated by mountain ranges — the Tirolese or German Alps on the north, the Rhœtian Alps in the center and the Trent Alps on the south. The loftiest peaks in Austria (*q. v.*), many of them in the region of perpetual snow, are in the Tirol. Brenner Pass, the lowest of the great passes of the Alps, is near the center of the province and on the line of travel between Italy and Germany. The Inn, the Adige and the Rhine on its borders are the principal rivers. About one third of the land can be cultivated, the rest being in forest or in the area of snows. The crops are corn, other grains and fruit. Goats and sheep are raised, and chamois, marmots and eagles abound. Gold, iron, copper and coal are found. There is a university at Innsbruck and other schools in the country. The people are divided into the German Tirolese in the north and the Italian Tirolese in the south, and nearly all are Roman Catholics. They are very patriotic, and are noted for their love of home and their national songs.

Tirol under the Romans was a part of Rhætia. It passed back and forth from Bavaria to Austria until 1814, when Austria finally claimed it. In 1809 the insurrection under Andreas Hofer took place, in which men and women fought side by side until hundreds were killed, because their country had been given to Bavaria. Population, 981,949. Consult *Tyrol and the Tyrolese* by Grohman and *The Valleys of Tyrol* by Busk.

Tzarsko-Selo or **Sofia**, a town in Russia, 15 miles south of St. Petersburg. It is the summer residence of the czar, and originally was a country-house of Peter the Great. The palace was built in 1744. The main building is 800 feet long, with large wings in addition. The rooms are magnificent, finished in gold, amber, *lapis lazuli* and other precious materials. There are a Gothic castle, an arsenal and a smaller palace, built by Alexander I. Population, 55,186.

U

U (*ōō*), the twenty-first letter, is a vowel, sometimes a semivowel. It is a rounded *v*, both being formerly used both as vowel and as consonant. Not till nearly 1700 was *V* restricted to expressing the consonant. The sound is produced by rounding the lips and raising the back of the tongue, and so *u* is called a labial vowel. The true primary sounds were the long *u* (*ūse*), as in *tool*, and the short *u* (*bŭll*), as in *wood*. *U* also has the sounds heard in *actuate*, *rural*, *fulfill*, *urn*, *up* and *submit*, the variations being due to the accent not falling on *u*. *U* is silent in *antique*, *gauge*, *rogue*. After *g* and *q*, *u* is a *W*, as in *guano*, *queen* and also in *suite*.

Uganda (*ōō-gän'dȧ*), a British inland protectorate in East Africa, covering the region about the equatorial lakes, Victoria, Albert, Albert Edward, Rudolf and Kioga. The area is estimated at 223,500 square miles, with a native population of about 3,000,000, of whom a third belong to the civilized and Christianized Baganda, speaking a Bantu tongue. They are a miracle of missions, the Anglicans having 250,000 adherents, the Roman Catholics 146,000. Trade is in the hands of German and British trading-firms, and is also carried on by British Indians, Persians and Arabs. The region is fertile, except in Rudolf, the northeastern province, with a rich fauna and flora; while iron, copper and even gold abound. Experiments are being made in growing arrowroot, coffee, cotton and rubber. The Ugandan government railroad extends 750 miles from the coast to Lake Victoria. The protectorate is divided for administrative purposes into five provinces, (Rudolf, Nile, Central, Uganda and Western), over which order is maintained by a force consisting of Sudanese, Uganda Rifles, an armed constabulary and native levies to the number, in all, of 4,000 men. The territory came under British influence in 1890, and four years later it was erected into a British protectorate. The Ugandan province, though directly under British administration, is recognized as a native kingdom. During the minority of the present king three chiefs are regents, and there is a native assembly. In most of the districts the native chiefs govern their subjects. It has mountain elevations from 10,000 to 19,000 feet, with snow-covered peaks, glaciers and volcanoes. The revenue is derived from taxes on huts and guns and from import-duties. The principal exports are ivory, skins and cattle. Nile steamers from Khartum reach Gondokoro on the northern boundary, and ships and steamers ply the lakes. But development threatens to be hampered by lack of native labor, for the inhabitants have been decimated by the sleeping-sickness. Changed boundaries leave the Ugandan railway from Mombasa to Kisimu wholly within the limits of the adjoining East Africa Protectorate. The telegraph has been extended from Entebbe to Gondokoro, crossing the Victoria Nile at Fajao.

Uhland (*ōō'länt*), **Johann Ludwig,** a German poet, was born at Tübingen in Würtemberg, April 26, 1787. He studied and practiced law at Tübingen, was a professor of the German language and literature in the university, a leader in the *diet* and a member of the Frankfort parliament. His writings consist of the dramas entitled *Ernest of Swabia* and *Louis the Bavarian*, works upon early German and Norse literature and mythology and the songs and ballads for which he is famous. The first collection of poems, made in 1815, were patriotic songs, called forth by the war against Napoleon, and more than 50 editions have been published. *The Castle by the Sea* and *The Black Knight*, found among Longfellow's poems, are translations from Uhland, and there have been various translations of his songs and ballads. He died at Tübingen, Nov. 13, 1862.

Uhlans (*ū'länz*), the light cavalry of the Tartars, who were brought into Europe by their colonies in Poland. They were mounted on Tartar horses, and carried only light arms, as the saber, lance and, later, the pistol. In the Prussian army all the light cavalry are called uhlans. They were conspicuous in the Franco-German War for bravery and agility.

Ujiji (*ōō-jē'jē*), a district in German East Africa (*q. v.*) on Lake Tanganyika. It is a fertile country, raising groundnuts, peas, beans, plantains, sweet potatoes, egg-plants and yams. Sugar-cane, tobacco and cotton are cultivated to some extent. The people, called the Wajiji, are large and strong, with flat feet, woolly hair and dark skins. In the town of Ujiji, a collection of huts with a bazar where the Arabs trade, Stanley found Livingstone in November, 1871. Population 14,000. See LIVINGSTONE and STANLEY.

Ulfilas (*ŭl'fĭ-lȧs*), a bishop of the Goths, was born about 310, and is thought to have

come from a family of Christians from Cappadocia, taken prisoners by the Goths. He was learned in Gothic, Greek and Hebrew and made a Gothic alphabet of 24 characters, modeled after the Greek. He translated the Bible, all but *Kings*, into Gothic, and his Bible was in constant use among their cities. It is the earliest specimen of any Teutonic language. He became bishop of the Goths in 341, and settled with the Christian part of the nation near Nicopolis, persuading them to practice agriculture and the arts of civilized life. He died at Constantinople in 381. Consult Scott's *Ulfilas, Apostle of the Goths*. See GOTHS.

Ulm, a city of Württemberg, is on the Danube River, 45 miles southeast of Stuttgart. It has one of the largest Protestant churches in Germany, one of the earliest libraries, with a remarkable collection of antiquities, and strong fortifications. Its pipe-bowls are noted and, with fine flour, make a large part of its trade. Ulm was an imperial city of Swabia (*q. v.*), and in the 15th century had within its walls and in the surrounding region belonging to it nearly 100,000 inhabitants. It suffered in nearly all the great German wars, and is the site of the defeat of the Austrian general, Mack, by Napoleon, Oct. 17, 1805. Population 51,820.

Ulysses (*ū-lĭs'sēz*) or **Odysseus** (*ō-dĭs'sūs*), a Greek hero. He was ruler of Ithaca, and feigned insanity to avoid taking part in the siege of Troy (*q. v.*). To show that he was crazy he plowed the sand on the seashore, but Palamedes exposed his deception by placing his infant son in the furrow, when he quickly turned the plowshare aside. Unsuccessful in his mission to demand the return of Helen, he joined in the ten years' siege, being one of the most prominent of the Greek leaders. He fought with Ajax for the prize of Achilles' armor, which he gained, and was one of the Greeks hid in the wooden horse, who captured the city. On the island of the Cyclops, when six of his companions were eaten by the giant, he put out the giant's one eye, and escaped by tying himself and his companions under the bodies of the sheep, which carried the men with them when let loose from the cave. At the island of Æolus that god gave Ulysses a bag containing the favorable winds, but the bag was opened by his followers, and, the winds escaping, the ships were driven back to the island. Circe the sorceress changed part of his followers into swine, but he overcame her spells with the help of Hermes. He passed the island of the Sirens safely by filling the ears of his followers with wax and tying himself to the mast. At Trinacria his followers, while he slept, killed some of the cattle of Helios, which they had been warned not to touch, whereupon a great storm arose, the ship was wrecked, and all on board were drowned but Ulysses. He lived seven years on the island of Ogygia with the nymph Calypso, returned at last to Ithaca after 20 years of absence, and slew the suitors of Penelope, his wife, with the help of Athené and of Telemachus, his son. *The Odyssey* gives the story of his wanderings.

Um'bel, a cluster of flowers in which the pedicels arise in a cycle from a common level, resulting in a flat-topped cluster. Often umbels are compound, each branch of the main cycle terminating in a cycle of pedicles bearing flowers. A cluster characteristic of the great family umbelliferæ. See INFLORESCENCE.

Um'bria, a country of ancient Italy, between the Adriatic Sea and Etruria or Tuscany. The Tiber and the Rubicon were among the principal rivers. It was one of the most powerful states in central Italy, but was conquered by the Romans in 308 B. C. The region is comprised in modern Perugia, a province of the kingdom of Italy. The area is 3,748 square miles, the population 685,042.

Un'alas'ka, one of the Aleutian Islands, the extension seaward of the Alaskan peninsula, which separates the Pacific Ocean from Bering Sea. The island lies at the passageway for steamers from San Francisco, Portland, Ore., and Victoria, B. C., proceeding to St. Michaels, the mouths of the Yukon and to Cape Nome. The chief village adjoins Dutch Harbor, and is named Unalaska, the population of which is about 400. The islanders are principally Aleuts, who support themselves by fishing; there also are a few Russians and Americans. Captain's Bay, a naval rendezvous, is the sheltered waterway in front of Unalaska town. It is 2,060 miles from Portland, Ore., and 2,344 from San Francisco.

Un'cas, an Indian chief of the Mohican tribe in Connecticut. The Mohicans (*q. v.*) were a band collected by Uncas after he had left the Pequot tribe, to which he belonged. He sided with the English in the war against the Pequots, and was so friendly with them that the Indians turned against him. In the wars which took place Uncas captured and killed the chief of the Narragansetts. Serveral tribes made war against him, and the Narragansetts would have starved him out of his stronghold had not the English sent him supplies by night. He was called a cruel and wicked man, but was faithful to his English allies. He died, very old, in 1682.

Uncle Sam, a nickname for the American nation, is a playful extension of the initials U. S. for United States. It corresponds to "John Bull," the nickname of England, as an attempt to personify a nation. It is said that the term originated in a jest made at Troy, N. Y., in 1812. An inquirer was told that the initials U. S., which occurred on certain goods purchased for the govern-

ment stood for *Uncle Sam*, of Samuel Wilson, a citizen of Troy. It is doubtful whether there is any truth in this story. Certainly, however, "Uncle Sam" was an accepted sobriquet for the United States as early as 1817. Uncle Sam is conventionally portrayed as a tall man, thin, with long, narrow beard, long-tailed coat and high hat.

Un'derground' Rail'road', the name popularly applied to the system adopted by many persons in the north, before the Civil War, for aiding fugitive slaves to escape from their masters into Canada, beyond the reach of the fugitive-slave law. Sympathizing abolitionists furnished the fugitives with food, hiding-places, transportation and advice, while they refused information or comfort to their pursuers. The most favored routes lay through Ohio and Pennsylvania. The houses along these routes where aid was given came to be known as "stations;" those persons directly assisting the run-a-ways as "conductors;" those who made contributions of clothing and money as "stockholders" in the enterprise Wm. Lloyd Garrison and Wendell Phillips were stockholders. Among the most active officials was Levi Coffin, who claimed to have actively engaged in the work for 33 years and to have received an average of 100 fugitives annually; he was often styled the president of the concern. Seibert in his exhaustive work on "The Underground Railroad" gives the names of 3,211 "agents, station-keepers and conductors." Many of them were heavily fined for violation of the law, but the practice continued to be one of the chief grievances of the south against the north.

Underwood, Oscar, W. Chairman of the Committee which drafted the 1913 tariff (*q. v.*), was born in Louisville, Ky., May 6, 1862, graduated from Virginia University, was admitted to the Bar in 1884 and practiced at Birmingham until his election to Congress in 1895. Although coming to opposite conclusions with regard to the tariff, Mr. Underwood, like Mr. McKinley, has made it a life study. In the preparation of the 1913 tariff he had the great advantage of practical business experience. This enabled him not only to analyze clearly a measure so vitally related to our business life, but to present it in clear terms to his colleagues and to the country at large. While not an orator in the popular sense, Mr. Underwood may be well said to be an orator in the true and practical sense which has been well defined to be the power to bring people to your way of thinking. United with this ability he has the same gift for conciliation and compromise which distinguished Mr. McKinley, and to this faculty combined with tireless industry, good health and singleness of purpose is due his successful guidance of the legislative work which determined the character and final enactment of the measure with which his name will always be identified. Although largely interested in the steel business himself, as part owner of an independent plant at Birmingham, he stood unflinchingly for downward revision.

Ungulates (*ŭn'gû-lăts*), the name for an order of hoofed mammals. The larger proportion of mammals belong to this interesting order, which embraces the species useful to man, as the horse, ox, sheep, camel, pig and deer. They all walk, so to speak, on the tips of their toes, each toe at the end being incased in a horny hoof. They are naturally divided into two groups: the odd-toed and the even-toed mammals. The former includes the horses (*q. v.*) with a single hoof, the rhinoceroses with three toes on each foot and the tapirs with three toes on the hind feet and four (one of which is not used) on the fore feet. The odd-toed mammals (*Perissodactyla*) have had a long geological history, and many modifications can be traced through those found in the rocks. The horse, for example, sprang from ancestors with five toes, and between those remote ancestors and the modern horse with a single toe lie more than two and one half million years (see EVOLUTION). The even-toed forms (*Artiodactyla*) include all those with cloven hoofs, as cattle, deer, sheep, goats, swine and the like. The hippopotamus has four toes on each foot. The swine has four toes, but the two outer are lifted above the ground and not of use in progression, and the cud-chewers have the toes reduced to two. These even-toed mammals likewise have a long history, and in the rocks are forms which lead up to those now existing.

U'nicorn, a legendary animal described by ancient authors as possessing the body of a horse and a single long horn, issuing from the forehead and projecting forward. It was supposed to inhabit India. This fabulous creature became a sign in heraldry. A somewhat similar animal with the cloven hoof and the beard of a goat is depicted on the coat-of-arms of England. The word translated *unicorn* in the Bible refers to some horned creature. It is supposed by some scholars that the buffalo is indicated.

U'niforms of the U. S.: Military and Naval. Of recent years, particularly since 1902, considerable changes have been made in the uniforms both of the army and the navy of the United States regular and volunteer forces. These have been introduced with the design of adapting them more effectively to the conditions of active service and to combine an ornamental and tasteful neatness with the idea of utility, but without undue display or ostentation. In accomplishing the changes the cumbrous helmet has been almost entirely discarded for a serviceable peaked cap (blue or khaki), retaining also the soft, felt, buff-colored campaign hat; while khaki, of a now fast

dye, has been adopted as the dress of portions of the army regiments (infantry, cavalry and engineers), and white has been retained as the working dress of soldiers in addition to officers in the navy. The prevailing color of the army uniform, for tunics or sacks as well as for the full-dress frock, is blue, with a blue of a lighter shade for the trousers; the khaki is of the same shade both for tunics and pants; while the prevailing color of the naval uniform (outside of white) is a dark blue, alike for tunics, frocks and trousers. The bandman's dress in the navy is the red tunic, with light-blue trousers, and helmet. For general and field officers (army) the full-dress coat is the double-breasted frock, with a double row of buttons, with epaulets for general officers and shoulder-straps for inferior ranks. The general officers wear a stripe of gold color, in full dress, down the trouser-leg; while the full-dress frock is adorned with a breast-cord and tassel of the corps, color of the department or arm of the service to which its bearer belongs. In the navy, on all but the white uniforms, the rank of an officer is indicated by gold-lace on the sleeve and devices on the collar, epaulet and shoulder-strap. Stripes of gold-lace of varying widths mark the rank on the sleeve of the officer from ensign to admiral; while all officers of the line or executive branch wear a gold star on the sleeve above the gold-lace.

The shoulder-straps of a second-lieutenant in the *army* are plain. A first-lieutenant's have a silver bar at both ends; a captain's two; a lieutenant-colonel's silver oak-leaves; a major's gold oak-leaves; a colonel's a silver eagle; a brigadier's a silver star; a major-general's two stars of silver; a lieutenant-general's three; the general's two silver stars, between which are a gold eagle and a device. All commissioned officers of the *navy* wear epaulets of gold-bullion on both shoulders, while strips of gold-embroidered, white oak-leaves or of gold-lace and devices on the shoulder-straps indicate the respective ranks.

U'nio, the name for a number of fresh-water mussels very abundant in the United States. Their name would indicate a single shell, but they are bivalves. For their structure see CLAM. Some forms, especially in the streams of Wisconsin, Ohio and New Jersey, contain pearls. These animals are gathered in great numbers, but the pearls are of infrequent occurrence and mostly small. Occasionally, however, those valued as high as $500 to $2,000 have been found. The shells are used for making pearl-buttons.

Union, N. J., a town of Hudson County on Hudson River, one mile from Hoboken. Its chief industry is the manufacture of silk, but it also has a large shirt-factory and breweries. It has the service of the West Shore and New York, Susquehanna and Western railways. Population 21,023.

Union Stock-Yards, Chicago. See STOCK-YARDS.

Uniontown, Pa., a borough, the seat of Fayette County, on the Pennsylvania and Baltimore and Ohio railways, 43 miles south-southeast of Pittsburgh. Settled in 1767, it became a town in 1783, and was incorporated as a borough in 1796. Situated in a region rich in iron, coal and coke, it has developed many industries connected with these minerals, among which are steel-works, carriage-works, a foundry, manufactories of glass-ware, leather and its products, a tannery, a brewery, a flour-mill and machine-shops. It also has natural gas. Population 13,344.

U'nit. See MEASUREMENT.

Uni'ted States of Amer'ica, The, a federal republic in North America, composed of states, territories and districts on the continent, of insular dependencies and possessions in the Pacific and Atlantic Oceans and of the Panama canal-zone in South America. Washington, D. C., is the capital.

AREA AND BOUNDARIES

The continental United States, excluding Alaska (*q. v.*), occupies the central area of North America. It lies between the Atlantic on the east, the Gulf of Mexico and Mexico on the south, the Pacific on the west and Canada on the north. It extends approximately from 67° W. to 125° W. in longitude and from 24° 30′ N. to 49° N. in latitude. Its longest line, east and west, is 3,100 miles; north and south, 1,780. Its continental area, including Alaska, is 3,617,673 square miles. (That of Alaska is 590,884.) But the republic's total territory, when the area of Guam, Guantanamo, Hawaii, the Philippines, Porto Rico (with Culebra and Vieques), the Panama zone, Danish West Indies, five Samoan islands and other islands in the Pacific is included, comprises over 3,750,700 square miles. (See articles on each.) Part of the northern boundary runs through Lakes Superior, Huron, Erie and Ontario and their connecting waters and through St. Lawrence, St. John and St. Croix Rivers, while the Rio Grande forms part of the southern boundary. The Canadian boundary extends 3,700 miles, the Mexican 2,105, and the entire boundary stretches 11,075 miles. The continental United States and Alaska almost equal all Europe in size, and the entire territory of the republic is surpassed in extent only by that of the British Empire, of Russia and of China. When the sun is setting on Porto Rico and Maine, it is rising on the Samoan and the Philippine Islands; and the American flag dominates the Arctic Ocean of Alaska and the tropical South Sea of Tutuila.

Coastal Features

The coasts on the Atlantic and Pacific Oceans reach 12,101 miles, the Atlantic coast (including that of the Mexican Gulf) being 9,568 miles in extent and the Pacific coast 2,533. This shows that the Atlantic coast, which is only 2,349 miles long if the windings of the shore are not followed and if the 3,551 miles of Gulf coast are deducted, is less regular than the Pacific coast. Consequently the most numerous and the largest harbors are on the Atlantic and face Europe. There are many large inlets and bays. Penobscot, Massachusetts, Cape Cod, Narragansett, New York, Delaware and Chesapeake Bays and Long Island, Albemarle and Pamlico Sounds are the most important indentations on the Atlantic shore. Along the Gulf are Apalachee, Galveston, Mobile and Tampa Bays. On the Pacific are Monterey, San Diego and San Francisco Bays, Puget Sound, the Strait of Fuca and Santa Barbara and San Pedro Channels. Alaska, too, has numerous bays and sounds. The United States shores of the Great Lakes (*q. v.*) add 3,000 miles more to the continental coasts of the republic. Their total length, following the windings of all shores, is 22,609 miles. (Those of Alaska and the islands cannot here be given.) There are no large islands off these coasts, Long Island (*q. v.*) being the most considerable. Next in importance come the islands off Maine and Massachusetts and the Santa Barbara group off California. Alaska has many large islands. Cuba is but 90 miles south of Florida, and southeast of Florida lie the nearby Bahamas. Prominent projections on the Atlantic coast are Capes Cod and Hatteras and the peninsula of Florida; in the Gulf the Mississippi delta and Cape San Blas; and on the Pacific Cape Mendocino. (See titles and Coast-Survey.)

Surface and Drainage

The United States divides naturally into four physical regions, two of which are elevations and the others lowlands. The elevated regions are the Appalachian Mountains in the east and the Rockies in the west, both trending north and south in general. (See Alleghany and Rocky Mountains.) There also are the Ozark Mountains of Missouri and the Black Hills of South Dakota. The lowland regions are the Atlantic slope and the Mississippi valley, the Pacific lowland being too narrow to form a main division.

The Appalachians extend from Canada into Georgia and Alabama, nearly parallel with the Atlantic, 20 to 100 miles inland, and known from north to south as the Height of Land in Maine, the White Mountains in New Hampshire, the Adirondacks and Catskills in New York, the Berkshires in Massachusetts and Connecticut, the Highlands in New Jersey and the Alleghanies in Pennsylvania and the south, where they have parallel ranges, as the Blue Ridge. (See articles under titles above.) This mountainous country, with heights of 6,000 feet, is about 100 miles wide, and forms nature's barrier between the Atlantic slope and the Mississippi valley. It, however, is broken by the Connecticut, Hudson, Mohawk, Delaware, Susquehanna, Potomac and James Rivers. (See these titles). Mitchell's Peak and Mount Washington are its highest points.

The Rockies, about 1,000 miles west of Mississippi River, reach from Mexico into Alaska. Their width averages 300 miles, though at some points it reaches 1,000 miles, and many of their peaks in the United States top 14,000 feet. The Sierra Nevada of California, the Cascade Range of Oregon and Washington and the Coast Range are parallel ridges of the Rocky Mountains. Mt. Whitney of the Sierra Nevada rises 14,887 feet and Mounts Hood and Shasta and Long's and Pike's Peaks are nearly as high. In Alaska Mt. McKinley towers 20,464 feet, the loftiest height on the continent; and St. Elias 18,024. (See the titles).

The Atlantic slope, between the Appalachians and the ocean, generally has low coasts, sloping inward to the hilly regions or Piedmont (*q. v.*) at the base of the mountains. Many of its rivers are navigable, the larger streams flowing more than 300 miles. Among these are the Penobscot, Kennebec, Hudson, Connecticut, Delaware, Susquehanna, Potomac, James, Cape Fear, Neuse, Roanoke, Santee, Savannah and Altamaha. (See titles). Small lakes also abound in New England and the middle states. The streams emptying into the Gulf include the Chattahoochee, Alabama, Pearl, Mississippi, Sabine, Trinity, Brazos, Colorado of Texas, Nueces and Rio Grande. The junction of the Atlantic slope and the Piedmont is marked by a ridge called the falls' line, because the streams from the Appalachians drop at this uplift and create the water-power of New England, the middle Atlantic states and the eastern states of the south. (See articles on the rivers named.)

The vast interior plain between the Appalachians and the Rockies and Canada and the Mexican Gulf is watered by the mighty Missouri and Mississippi and their 10,000 tributaries and is one of the most fertile regions on the globe. Its hills are covered with forests and its plains and prairies produce the huge crops of grain and cotton that feed and clothe the world. The eastern part of this central region is hilly, and West Virginia and eastern Tennessee and Kentucky are covered with heavy forests. The center is prairie, merging toward the Rockies into enormous plains covered with wild

Map-Picture Story of Uncle Sa

If you could visit the United States "all at once" this map tells in a striking way how its na

WESTERN STATES.

1, Fishing Schooner. 2, Fishing Boat. 3, Salmon Fishing. 4, Apples. 5, Wheat. 6, Copper. 7, Hogs. 8, Sheep. 9, Lumber. 10, Lumber Boat. 11, Grapes. 12, Gold and Silver. 13, Silver. 14, Salt. 15, Cattle, Horses and Sheep. 16, Coal. 17, Alfalfa. 18, Copper. 19, Gold. 20, Peaches. 21, Oil. 22, Oranges. 23, Dates. 24, Vegetables (Irrigated Land). 25, Apples (Irrigated Land). 26, Sheep.

CENTRAL STATES.

1, Spring Wheat. 2, Lumber. 3, Copper. 4, Flo Mill. 5, Iron. 6, Apples. 7, Potatoes. 8, Dai 9, Butter and Cheese. 10, Cattle. 11, Horses. Corn. 13, Packing House. 14, Lumber Yard. General Manufacture. 16, Hogs. 17, Oats. 18, C tle. 19, Apples. 20, Winter Wheat. 21, Lumb 22, Furniture. 23, Automobiles. 24, Oil. 25, bacco.

Resources and Great Industries

ources and the great industries based upon them would look, and where they are located:

SOUTHERN STATES.

1, Cattle. 2, Sheep. 3, Horses. 4, Oil. 5, Vegeables. 6, Lumber. 7, Sugar Cane. 8, Steel Mill. Coal. 10, Cotton. 11, Turpentine. 12, Lumber. Tobacco. 14, Vegetables. 15, Oranges. 16, Pineples. 17, Oyster Boats. 18, Oyster Boat.

MIDDLE ATLANTIC.

1, Cattle. 2, Grain Elevator. 3, Butter. 4, Cattle. 5, Steel Manufacturing. 6, Oil. 7, Coal. 8, Peanuts. 9, Tobacco.

NEW ENGLAND STATES.

1, Lumber. 2, Fishing Boat. 3, Oyster Boats. 4. Paper Mill. 5, General Manufacturing. 6, Fishing.

grass, sage-brush and cactus, having but slight rainfall and depending on irrigation (*q. v.*) to render it profitable to cultivate. In the north the plain drains into the Great Lakes and forms the lake region; in the south, where it meets with the Atlantic plain in Alabama, it drains to the Gulf and forms the Gulf region, which extends from Georgia and Florida far into Texas. The great rivers of the Mississippi valley are the Missouri and the Mississippi and their chief branches, as the Ohio, Minnesota, Wisconsin, Yellowstone, Dakota, Platte, Des Moines, Illinois, Kansas, Arkansas, Red and Yazoo, to say nothing of such tributaries of the Ohio as the Cumberland, Tennessee or Wabash or of the tributaries of the other chief branches. Many of these and their tributaries extend from 1,000 to 2,000 miles. The Mississippi valley is also bordered by the world's largest bodies of fresh water, which the St. Lawrence connects with the Atlantic, while Wisconsin, Minnesota and Michigan are noted for numerous small lakes.

The Pacific slope comprises the most varied region of the United States, broken by great plains and lofty mountain-valleys 10,000 feet above the sea, descending by great steps to the lower levels. It has huge cañons — river-beds thousands of feet deep; arid plains; heavy forests in the north; and a great basin without drainage to the sea. Here is the famous Great Salt Lake of Utah. Its rivers are the Columbia and its branches; the San Joaquin; the Sacramento and the Colorado of the west, all flowing into the Pacific.

The drainage-systems of the United States number five, and have already received full description in the article on AMERICA (NORTH). They comprise the Atlantic, Gulf (including the Missouri-Mississippi system also), Great Basin, Lake and Pacific river-systems. (See articles on each topic). They give the country 100,000 miles of inland navigation — the most extensive in the world. Among the minor lakes, in distinction from the Great Lakes, may be mentioned Champlain, Moosehead, Oneida and its famous sister-lakes in New York, Salt Lake and Tahoe. (See these titles).

Natural Features. No country equals the United States in beauty, grandeur and variety of scenery. Among the many interesting features are Crawford Notch, Delaware Water-Gap, the Hudson Highlands and Palisades, Watkins Glen, Niagara Falls, Luray Cave, the Natural Bridges in Utah and Virginia, Harper's Ferry, Mammoth Cave in Kentucky, the vast prairies, the inland seas, the mighty streams of the interior, St. Anthony and Minnehaha Falls, the Dalles of the Wisconsin, the Pictured Rocks, the passes of the Missouri and of the Columbia through the mountains, the falls of the Yellowstone, Snake and Missouri Rivers, Yellowstone Park, the hot-springs and the geysers, Yosemite Park and Falls, the Big Trees, Royal Gorge, Grand Cañon and the Yellowstone Cañon. (See articles under titles above and GEOGRAPHY, GEOLOGY and GEOLOGICAL SURVEY.)

CLIMATE

The climate of a country stretching over 24½ degrees of latitude and ranging from coastal plains to lofty mountains and tablelands varies greatly. In most parts of the land it is extremely changeable, with great variations of temperature between summer and winter. The Atlantic states are colder than European countries in the same latitudes, but the Pacific coast has a climate as mild as Italy's. The Gulf states and Georgia and South Carolina verge toward a subtropical climate. The rainfall is plentiful, except in some parts of the west, and is distributed throughout the year, except on the Pacific coast, where it occurs in spring and in winter. There also is every variety of soil, including prairie lands covered with rich mould, sometimes 25 feet deep, and the sterile, arid plains of the Utah or Great Basin. (See AGRICULTURE, AMERICA, COLD WAVE, RAIN and SOIL.)

RESOURCES

These consist of the natural products of the soil and the waters, as minerals, forests, native plants and animals and fish and other aquatic animals. Their vast variety and abundance, with the great range of climate, make the United States a world in itself, able to raise almost all products of the temperate and the tropical zones. For the flora and fauna see AMERICA and articles on such subjects as, *e. g.*, CORN or DEER.

Minerals. These include coal, copper, gold, iron, lead, mercury, nickel, platinum, precious stones, silver, zinc and such building-stones as granite, limestone, marble, sandstone, slate and trap. (See articles under titles above.) Aluminum, asphalt, clay, gypsum, mineral springs, natural gas, petroleum, Portland cement, phosphate-rock and salt also abound. (See articles on each.) In the production of aluminum, coal, copper, iron, lead, natural gas, petroleum, quicksilver, phosphate-rock, silver and steel the United States ranks first; in producing gold it stands second; in zinc third. In 1910 the production of gold was 4,657,018 ounces or $96,269,100; of silver 57,137,900 ounces or $30,854,500; of coal (anthracite and bituminous) 501,596,378 metric tons worth $629,557,021; of iron 27,303,567 tons; of steel 26,049,919 tons, the value of the steel and iron tonnage together being $1,000,000,000; and of lead 372,227 tons worth $32,755,976. In 1910 *all* mineral products were worth $2,003,744,-

869; nonmetallic ones $1,242,701,402; metallic ones $760,743,467; and other products $300,000. Much of the vast mineral wealth, especially in the south, remains undeveloped.

Forests. A greater variety of trees is found in the United States than in Europe, though nearly all European trees are found here, and originally forests covered a third of the country. But many sections in the Appalachians and around the Great Lakes have been stripped almost bare. Ash, beech, birch, chestnut, maple, oak, pine and walnut abound in the east; hemlock, spruce and white pine in the north; Douglas fir, redwood, sequoia and yellow cedar on the Pacific slope; and cypress and yellow pine in the south. (See articles under titles above.) The prairies originally were treeless as a whole, except along streams, but forests have been planted to a considerable extent. Nearly 1,100,000 square miles of the United States are woodland, nearly a third being on the Rockies and along the Pacific. Probably the heaviest stand of timber on earth is found in California, Oregon and Washington. See AMERICA (*Animals and Vegetables*); EUROPE (*Natural History*); FOREST-RESERVES; LUMBERING; and NATIONAL PARKS.

Fish and Game. The varieties of fish in United States waters number 816, of mollusks 1,000; while the mammals number 310 varieties, the birds 756. The most important fish, commercially, are the bluefish, cod, halibut, herring, mackerel, menhaden, sardines and shad of the Atlantic; the redfish and tarpon of the Gulf; the salmon of the Pacific; and the bass, perch, pickerel, pike, muskellunge, salmon, trout and whitefish of the inland waters. The chief gamebirds and waterfowl used as food are ducks, grouse, pigeons, quail, turkey and wild geese. The most important game-animals are antelope, bear, deer, mountain-sheep (nearly extinct) and moose. The chief edible mollusks are clams, lobsters, oysters and scallops. The terrapin is another marine delicacy. (See articles under titles above and FISH-CULTURE, FISHES and FURS.)

INDUSTRIES

The chief classes of industries in the order of importance are manufacturing, agriculture (including stock-raising), mining, forestry (or lumbering) and fishing. In each of these industries the United States leads the world The value of the products of manufactures in 1909 was $20,672,052,000; of those of agriculture, in 1910, $8,926,000,000 (over one-half being products of farm animals); of those of mining $2,003,744,869 in 1910, of those of lumbering $724,705,760 in 1909; and of those of fishing $67,898,859, while the output of the fish-canneries was worth $27,648,289. Thus the four main groups of industries annually average an output worth over $32,000,000,000.

Manufactures. During the last 40 or 45 years manufactures have expanded more rapidly than has any other class of industries. The east has become an almost exclusively manufacturing section, but the interior and the south have made enormous strides as manufacturers. Abundant natural resources from farm, forest, mine and waters; cheapness and plentifulness of fuel; fine water-power, with steam and electricity; inventive genius in the people; intelligence, industry and thrift; exceptional facilities for transportation; millions of immigrants; unhindered commerce between the states; and unequaled advantages for labor as well as for capital from the laws of the land, the national and state constitutions and the democratic nature of American society—have all combined to make the United States the source of a third of the world's manufactures. The sole disadvantage has been the high price of labor. This has been offset by its efficiency and the low cost of food and clothing. The 1910 census of manufactures, which was confined to factories and excluded local industries and hand trades, grouped them as follows, according to the character of the finished products: Food and kindred products; textiles; iron and steel and their products; leather and its products; chemicals and allied products; clay, glass and stone products; vehicles for land transportation, and miscellaneous industries. Among these food and kindred products led with a value of over $3,035,000,000. Iron, steel and their products, including foundry and machine shop products, steel works, rolling mills and blast furnaces, were worth over $2,605,000,000; textiles, $1,684,636,000; flour and grist mill products, $883,584,000. The establishments numbered 268,491, representing an investment of $18,428,270,000, having a force of employes (salaried and wage-earning) of 7,405,313, and paying them $4,365,613,000. The food industries include the making of butter, cheese and condensed milk, canning and preserving, flour-making and grist-milling, rice-cleaning, slaughtering and meat-packing and sugar-refining. The textiles manufactured are carpets and rugs, cordage and twine, cotton and felt goods, hosiery and knit goods, oilcloth and linoleum, shoddy, silks, woolens, worsteds, etc. Iron and steel manufactures produce bars, castings, blooms, forgings, ingots, plate, rails, slabs and structural shapes. The manufacture of automobiles is now an important industry, the number turned out in 1909 being 127,287, valued at $249,202,075. The chemical and allied industries included acids, cottonseed product, dye-stuffs, extracts, explosives, fertilizers, gas, paints and petroleum-refining. Electricity, gas, steam, water and even wind-

mills and animals were used to produce power. The manufacture of electrical apparatus has become an immense industry, and in making agricultural machines and tools the United States excels every other country. The hand-trades and the local industries annually produce over $1,200,000,000 of goods. The manufactures of the United States equal those of France, Germany and the United Kingdom together. (See FURNITURE, GLASS, SMELTING and STEEL; articles on other manufactures; and the subject of *Manufactures* in articles on states.)

Agriculture. Fore more than a century the United States has been the greatest agricultural country on the globe. The American farmer in two years produces more wealth than have all the gold-mines of the entire world since 1492. The immense extent of fertile land, the liberal policy of the national government as to the public domain (see HOMESTEAD LAWS and PREËMPTION), the climatic advantages and the comparative ease of access are among the causes that brought about this preëminence. In the continental United States, excluding Alaska and the islands, there remained 327,489,968 acres of public lands on July 1, 1911, still available for settlement. Most of this, however, is in mountainous and arid regions. In 1910 the farms were worth $28,475,674,169. The size of an average farm is about 138 acres. Agriculture employs nearly 11,000,000 people, almost half of all laborers in the United States, and almost 5,000,000 families live on farms. The chief agricultural areas are the central plain from the Appalachians to 100° W.; the Gulf states and Georgia; and the Pacific slope. But the Atlantic slope also abounds in valuable farms on its fertile lowlands; and the soil of the arid regions along the Rockies — regions comprising nearly a third of the United States—is generally fertile and only needs irrigation (*q. v.*). New York and New England chiefly engage in mixed farming and in dairying; the Mississippi valley grows the cereals; the south cotton, sugar, tobacco and tropical fruits, besides truck-farming for northern markets; and the Pacific coast grain and fruits. The agricultural products of the United States form the bulk of the exports.

Cereals are the most important farm-product, and corn (*q. v.*) leads in the amount grown. In 1910 the yields were 3,125,713,000 bushels of corn; 1,126,765,000 of oats; 695,443,000 of wheat; 162,227,000 of barley; 33,039,000 of rye (some European countries far surpassing the United States as producers of rye); 24,510,000 of rice; and 17,239,000 of buckwheat. (See articles under these titles.) In 1910 the corn of the United States was worth $1,523,713,000; the wheat $621,443,000; the oats $384,716,000; the barley $93,785,000; the rye $23,840,000; and the buckwheat $11,231,000. All cereals in that year totaled 5,140,896,000 bushels and were valued at $2,710,000,000.

Cotton (*q. v.*) stands next to corn as a commercial asset of the United States. It is the chief product of the south, and in 1909 it was worth $703,619,303. The cotton states from first to last in production that year were Texas, Georgia, South Carolina, Alabama, Mississippi, Arkansas, North Carolina, Oklahoma, Louisiana, Tennessee, Florida, Missouri, Virginia and Kentucky.

The humble hay-crop, however, has sometimes been worth even more than cotton, though lacking its commercial and industrial importance, for in 1910 it weighed 60,978,000 tons and was valued at $747,769,000.

Potatoes (Irish and sweet) were valued at ($187,985,000), Wisconsin, Minnesota and New York raising Irish potatoes in large quantities, and southern Illinois and the south the sweet potato. See POTATO.

Fruit-raising, taken in the widest sense, is a great branch of American agriculture. In Delaware, Florida, New Jersey, southern California, western New York and western Michigan it is the leading industry of the farm. In the mountainous regions of Montana, in Oregon and in Washington it also is a great industry. Oranges and pine-apples are the chief fruits of Florida; almonds, apricots, grapes, lemons, oranges and prunes of the greatest importance in California; grapes in New York and Ohio; apples in New York and New England; peaches in Michigan and Georgia. Small fruits, as blackberries, gooseberries, raspberries and strawberries, are grown almost everywhere. Over half a billion bushels of apples, apricots, grapes, peaches, pears, prunes and small fruits are raised, apples being largely exported, and the value of the fruit crops, nuts and orchard products some years reaching $140,000,000. (See FRUIT and articles under titles as above.)

Tobacco (*q. v.*) is another of the great crops. In 1910 it was raised on 1,233,800 acres to the amount of 894,349,000 pounds valued at $91,458,773. For rice and sugar see articles under these titles. In 1910–11 the output of cane-sugar was 311,000 tons; beet-sugar 455,000 tons, the sugar-beet being cultivated in many of the states with temperate climates. Considerable flax is grown, chiefly for seed, in Minnesota, Wisconsin and some other states of the north, the yield in 1909 being 25,856,000 bushels.

Stock raising (including poultry farming) and dairying are other great branches of American agriculture. In 1909 the dairy factories used 9,888,727,303 pounds of milk and 1,406,143,908 pounds of cream, and made 624,764,653 pounds of butter; 311,126,317 of cheese, and 494,796,544 of condensed milk, the value of the three being $274,557,718. New York, Wisconsin and

Iowa have the largest dairy-industries. The leading states in the raising of poultry are Iowa, Illinois, Missouri, Ohio and Indiana. Among the grazing states Texas leads in the raising of cattle, Montana in that of sheep. In 1911 the wool-clip was 318,547,900 pounds, the United States ranking only fourth among the wool-producing countries of the world. (See DAIRY-FACTORY, GARDENING, GRAZING, POULTRY, RANCHING, STOCK-RAISING and WOOL.)

Mining. This stands third among the groups of industries of the United States. The total quantity of ores, minerals and metals produced can not be given, because the measures for the different products differ, but in 1910 their value was $2,003,744,869. (See MINING and articles on such subjects, in alphabetical order, as ALUMINUM, MICA or ZINC.) Gold is produced mainly in Colorado, California and Nevada; silver in Colorado, Montana, Utah and Idaho; sapphires in Montana, North Carolina and Idaho; and turquoises in Arizona and New Mexico. Agates, amethysts, beryls, diamonds, garnets, pearls, rubies, quartz crystals and tourmaline are also found. (See articles under these titles.) Since 1902 about $1,500,000 of precious stones (*q v.*) have been mined.

Lumbering. This industry ranks fourth among those of the country, the manufacturing, agricultural and mining *groups* of industries preceding it, as do also the *single* industries of steel and iron, textiles and slaughtering and meat-packing. Two-thirds of the woodland are in the east and south, less than a third being on the Pacific slope and the Rockies. The merchantable forests cover 500,000 square miles. Of the 320,000 square miles of these forests in the east, the lake states and the south, 175,000 are soft wood and the rest hard wood. The white pine is in Michigan, Minnesota and Wisconsin, the yellow in the southern states. In 1909 there were 40,671 lumbering establishments with a capital of $1,176,675,000. They used $508,118,000 of raw material. The finished product, excluding fuel, minor products, naval stores and woodpulp, was worth $1,156,129,000. The value of the sawn lumber was $435,708,084. Four fifths of the cut come from the conifers. (See FOREST, LUMBERING, PINE and articles on such states as CALIFORNIA, GEORGIA, MAINE, MICHIGAN, OREGON, WASHINGTON and WISCONSIN.)

Fishing. In the extent and value of its fisheries the United States leads the world. The industry employs 6,931 vessels and 219,139 men; has a capital of $93,874,269; and produces to the value of $59,977,339. (The statistics include Alaska and sealing.) The Atlantic states produce about 75% of the output, the Pacific states 15, the Great Lakes and the Gulf five each (about 50,000 tons each annually.) The total fish-catch is over 1,000,000 tons a year, the aggregate catch from waters not included in the enumeration being considerable. Alaska, Oregon and Washington put up salmon; Massachusetts cures cod, herring and mackerel; and Maine tins sardines. Fish-canning and fish-preserving establishments in 1908 numbered 690, and employed 15,251 wage-earners, who were paid $4,247,000. The capital was $24,124,000 and the value of the output was $28,401,000. (See articles under titles above and BERING SEA, FURS and SEALS.)

COMMERCE

This is both domestic and foreign. The first is larger than that of any other country, and greatly surpasses that with outside nations. As shipments of interstate commerce are not entered at custom-houses, no statement as to the amount of domestic commerce can be made. But in foreign commerce, though America is only third among nations, our exports in 1911-12 were $2,204,322,000 and the imports $1,653,265,000. The best customers of the United States are the United Kingdom, Canada, and Germany, the next in order being France and Netherlands, as buyers, and as sellers, the United Kingdom and Germany leading, with France, Brazil, Cuba, and Canada following in the order named. Nearly $1,342,000,000 of our exports in 1911-12 (excluding gold and silver) went to Europe, while nearly $517,000,000 went to North America outside of the United States. Asia and Oceania took $189,400,000; South America $132,310,000; and Africa $24,000,000. From Europe we imported $819,585,000 worth of products; from North American countries $334,072,000; from Asia and Oceania $262,000,000; from South America $215,089,000 and from Africa $22,586,000. Our chief exports in 1912 consist of cotton, $565,849,000; iron, steel and their products, $268,154,000; meat and dairy products, $156,261,000; and breadstuffs, $123,980,000. Agricultural products form not quite one-half of the exports, manufactures about the same proportion. The leading imports in 1911-12 were coffee, $117,826,000; sugar, $115,515,000; india rubber and gutta-percha, crude, $102,942,000; hides and skins, $102,476,000; chemicals, drugs, and dyes, $92,030,000; raw silk, $69,542,000; and cotton goods $65,153,000. Raw materials formed 34% of the imports; manufactures for further use in manufacturing, 18; manufactures ready for consumption, 22; and animals and foods 26. The Atlantic slope transacts nearly two-thirds of the foreign commerce of the United States.

COMMUNICATION

Transportation in the United States is effected by means of waterways, roads, steam railroads and electric railways.

125°
120°
115°
110°
105°
100°
45°
40°
35°
30°
25°
Vancouver
Victoria
Seattle
Spokane
Portland
Salem
Eugene
Medford
Klamath Falls
Crater Lake
Mt. Shasta
Lassen Peak
Sacramento
San Francisco
Stockton
Fresno
Bakersfield
Los Angeles
San Bernardino
Riverside
San Diego
Santa Barbara
Death Valley
Mt. Whitney
Reno
Carson City
Virginia City
Winnemucca
Elko
Ely
Eureka
Austin
Tonopah
Goldfield
Las Vegas
Hawthorne
Pyramid Lake
Walker Lake
Mono Lake
Owens Lake
Salton Sea
Great Salt Lake
Salt Lake City
Ogden
Provo
Logan
Pocatello
Idaho Falls
Boise
Nampa
Caldwell
Weiser
Lewiston
Walla Walla
Yakima
Wenatchee
Olympia
Tacoma
Bellingham
Mt. Baker
Mt. Rainier
Mt. Adams
Mt. Hood
Crater Lake
Klamath Lake
Upper Klamath Lake
Goose Lake
Harney Lake
Malheur Lake
Summer Lake
Abert Lake
Silver Lake
Lake Tahoe
Pyramid Lake
Walker Lake
Mono Lake
Owens Lake
Death Valley
Salton Sea
Great Salt Lake
Utah Lake
Sevier Lake
Fish Springs
Rush Lake
Deseret
Escalante
Kanab
Grand Canon
Colorado R.
Green River
Virgin R.
Gila R.
Salt R.
Bill Williams Fork
Little Colorado R.
Rio Grande
Pecos R.
Canadian R.
Arkansas R.
Platte R.
Missouri R.
Yellowstone R.
Milk R.
Marias R.
Saskatchewan R.
Bow R.
Red Deer R.
Battle R.
Peace R.
Athabasca R.
Slave R.
Great Slave Lake
Great Bear Lake
Lake Athabasca
Lake Winnipegosis
Lake Manitoba
Lake of the Woods
Lake Winnipeg
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
Lake Champlain
Lake Memphremagog
Lake Temiscouata
Lake Timiskaming
Lake Nipissing
Lake Abitibi
Lake Mistassini
Lake Kootenay
Lake Pend d'Oreille
Lake Coeur d'Alene
Flathead Lake
Lake Chelan
Lake Washington
Lake Whatcom
Lake Pleasant
Lake Winnipeg
Lake Winnipegosis
Lake Manitoba
Lake of the Woods

UNITED STATES

SCALE

Statute Miles, 240=1 Inch.

0 25 50 100 200 300 400 500

Rand McNally's New 11 x 14 Map of United States.
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Communication is carried on by means of these and also by telegraphs, telephones and postal service. The waterways consist of the seas, rivers, lakes and canals. The last three offer 100,000 miles of inland navigation. The 38 principal canals used for commercial purposes extend nearly 2,500 miles. The Missouri-Mississippi system and the Great Lakes are the most important means of internal transportation by water. (See CANALS, GREAT LAKES and articles on rivers and states.)

American shipping in 1911 comprised 12,684 sailing vessels (including canal-boats and barges) and 13,307 steamships (*q. v.*), the tonnage of both classes aggregating 7,638,790 tons. The foreign commerce is, nine tenths of it, carried in foreign ships. The Atlantic and Gulf shipping is two thirds of the total American shipping and half of the tonnage. That of the lakes is an eighth of the number and a third of the tonnage. (See SHIPBUILDING.) The tonnage engaged in fisheries numbers 54,982 tons; in foreign trade only 863,495 tons; but in coastal trade 6,720,313 tons. The Atlantic ports had two-thirds of the shipping that entered and cleared.

The railways of the continental United States date from 1826, and in 1910 their total mileage was 240,438 miles, nearly half of the world's railway mileage and much more than that of Europe. As Britain is the island of ships, so the United States is the continent of railways. They penetrate every state and territory, even Alaska, Panama, Porto Rico and the Philippines; employ 1,699,420 men, whose wages in 1910 were $1,143,725,000; and in 1910 they carried 971,683,199 passengers and 1,849,900,000 tons of freight. Their passenger-cars would make a train over 500 miles long. their freight-cars and engines another of nearly 10,000 miles length. There are about 1,000 companies operating them. (See HARRIMAN, HILL, MORGAN and RAILROADS.) The United States systems also interlink with the Mexican and Canadian systems, American trains running from St. Louis into the City of Mexico, the Canadian Pacific crossing Maine and the Grand Trunk entering Portland and Chicago. In 1910 there were 40,088 miles of street and elevated roads operated by electricity and a few hundred miles operated by other power, and in densely peopled regions they are girdling the country with a network of interurban lines. (See ELECTRIC RAILWAY.) Wagon-roads, except in a few sections of the east, are inferior to those of Europe.

The telegraph and the telephone in the United States are private enterprises. In 1915 one telegraph company had 1,610,000 miles of wire and transmitted nearly 100,000,000 messages, excluding railway messages and those over leased wires. In 1906 the next largest company had 321,570 miles of wire and nearly 24,000 offices. Six cables connect the United States and Europe, while another links it with the Philippines and China. There also are cables to the Antilles and South America. In 1915 the Bell Telephone System alone had over 150,000 employees, and 18,500,000 miles of wire; owned 6,000,000 telephones, and connected with an additional 3,000,000 telephones of Non-Bell (Independent) Companies. The total number of completed messages or talks over its lines and telephones during the year was nearly 9,000,000,000 and the opening of the transcontinental telephone line, Jan. 25, 1915, makes it possible to talk from coast to coast, 3,400 miles, and from points in any one state to some points in every other state of the Union.

(See CABLES, TELEGRAPH and TELEPHONE.)

The postal business is carried on by the federal government (see POSTOFFICE and DEAD-LETTER OFFICE), the transportation of small or valuable freight by private express-companies, though large goods are also forwarded through them if speed or special safety is desired. (See EXPRESS COMPANIES.) In 1910 the postoffice handled 14,850,102,559 pieces of mail at a cost of $229,977,224 at 59,580 offices. The rapidity of travel and communication in the United States is evinced by the fact that it takes the mail only four days and nine hours to traverse the 3,250 miles between New York City and San Francisco.

GOVERNMENT

This is based on the federal constitution of 1787 and the constitutions of the states. The national government (*q. v.*) began in 1774; the states when the first continental congress initiated their governments. The United States government is a federal republic, and each state is a representative republic, governing itself in its own affairs but without sovereignty and without any relation to any foreign power. The national constitution, which can be altered by the people, defines the powers of the federal government, and reserves "to the states respectively or to the people the powers not delegated to the United States by the constitution nor by it prohibited to the states." The administration of the affairs of the Union is entrusted to the executive, the legislative and the judicial authority.

Executive power is vested in a president (*q. v.*), the head of the government, and in a vice-president. Both are elected for a four years' term by an electoral college (*q. v.*). The president is commander-in-chief of the army and navy, though never appearing at their head, and of the militia in the service of the Union. Washington, for greater efficiency in the executive, in 1789 established the extraconstitutional departments of the navy, the postoffice (a

postal system, however, existing before the Revolution), state, treasury and war; and in 1840 that of the interior was added, in 1870 justice, in 1889 agriculture, and in 1903 commerce and labor. (See UNITED STATES DEPARTMENTS.) The heads of these are executive officers, called secretaries except the attorney-general and the postmaster-general, are appointed by the president with the approval of the senate, and form his cabinet (*q. v.*) or body of advisers. The president also appoints ambassadors, judges of the federal courts and almost all of the higher executive officers. (See DIPLOMATIC SERVICE). In the civil service (*q. v.*) of the Union there are nearly 330,000 executives. The vice-president is president of the national senate, *ex officio*, and, if the president die or resign, becomes president. His salary is $12,000 a year. If the vice-president die, a temporary president of the senate discharges his duties and receives his salary.

Legislative authority over the Union is vested in a national congress (*q. v.*), consisting of a senate and a house of representatives. The first, nominally the ranking authority, represents the states; the second the people. Both bodies are now chosen by popular vote, a Constitutional amendment for direct election of senators being adopted in 1913. Each state has two senators, but has only so many representatives in the lower house as its population entitles it to. Nevada, *e. g.*, has only about 50,000 inhabitants, New York over 8,000,000; yet Nevada as a state has two senators, but its people have only one representative in the house. As there is one representative to every 211,877 inhabitants, states of less population are given a representative. Representatives are elected for two years, senators for six, but a third of the senate goes out every two years. Territories send delegates to the house of representatives, Porto Rico a resident-commissioner. These are elected as representatives are; can speak in the house and make motions; but cannot vote. The salaries of senators, representatives, delegates and the Porto Rican commissioner are $7,500 a year (since March 4, 1907), with their expenses in travel, but the speaker receives $12,000. Alaska and the Philippines have an inofficial representation, but the District of Columbia has not even this. Congress governs the territories and districts and has power to enact legislation affecting the whole country, but it cannot change the laws of a state.

Judicial authority over the nation is vested in a supreme court, nine circuit-courts, a court of claims and 69 district-courts. (See COURTS.) Each circuit also has a court of appeals. There also are federal courts for the districts and for the territories. The national courts try civil causes arising from the laws of the *nation;* causes between citizens of different states and crimes against the whole United States. These crimes consist chiefly of murder on the high seas, offences against postal or revenue laws and piracy. The judges of these federal courts are appointed for life by the president with the approval of the senate. Each state forms a district or several districts. The chief-justice of the supreme court receives $10,500 a year, the eight associate-justices $10,000 each. (See also, CONGRESS and UNITED STATES DEPARTMENTS: JUSTICE.)

Each branch of the federal government is independent within limits of the others. To a degree they are subordinate. Yet all are so related together as to form a whole. The president or executive can veto a law of Congress and has such powers of a sovereign as appointing ambassadors and judges; but Congress, if two thirds of the senators and two thirds of the representatives sustain the vetoed law, can pass it; and the senate can refuse consent to his appointments. Only Congress can originate legislation; but the federal courts determine whether its laws are in keeping with the national constitution. Yet Congress has judicial functions, too, for the house alone has the power of impeachment and the senate then sits as a high court. The senate also has the executive function of ratifying or rejecting treaties that the president makes with foreign countries. It is such features as these that made Gladstone pronounce the federal constitution "the most wonderful work ever struck out at a given time by the hand and purpose of man."

The state governments mainly follow that of the nation. Each state must have a republican constitution, but thus derives its powers from the citizens of the state. Admission of territories to the Union as states is effected by act of Congress and proclamation of the president. The state deals with all matters not reserved for the national government by the federal constitution nor falling within restrictions imposed by its own. It determines the qualifications for suffrage, and controls all elections. It also controls criminal and civil law, persons, property and civil relations, marriage, divorce, education and charities, fisheries, game-laws, libelling and trusts. It charters and controls all corporations (*q. v.*) subject only to Congress's right to regulate interstate commerce; and it also regulates labor (*q. v.*). The state derives its revenue chiefly from a direct tax on property. (See *Government* in articles on states.) Local government within a state is carried on by a borough or a municipality and by a county or a township. (See CITIZENSHIP, FACTORY LEGISLATION, MUNICIPAL GOVERNMENT and TOWN-MEETING.)

Territorial governments are states' govern-

ments in the making. A territory is a possession of the Union, and is governed by national or federal authorities. The president appoints its officers, but the people elect a legislature, though federal statutes may modify or even annul its laws. The Districts of Alaska and Columbia have no power of self-government. Indians on reservations and non-naturalized inhabitants of the United States are ruled by the federal government. When territories become populous enough and attain industrial or commercial importance, they may, if they wish, become states by forming a constitution, organizing a government and satisfying Congress that they have complied with all requirements of the national constitution. (For the forms of government in Alaska, the District of Columbia, Hawaii, Panama, the Philippines and Porto Rico see these titles).

Political Divisions. The republic politically consists of states, territories and districts and of dependencies or possessions. There are now 48 states, one territory and two districts. The possessions comprise Guantanamo Naval Station, Guam, the Panama zone, the Philippines, Porto Rico, three of the Samoan islands and many islets in the Pacific. The states include 13 that originated in English colonization, six that came into the Union without ever having been territories and 29 that had been territories. The territory is Hawaii; the districts Alaska and Columbia; the states

Alabama	Nebraska
Arizona	Nevada
Arkansas	New Hampshire
California	New Jersey
Colorado	New Mexico
Connecticut	New York
Delaware	North Carolina
Florida	North Dakota
Georgia	Ohio
Idaho	Oklahoma
Illinois	Oregon
Indiana	Pennsylvania
Iowa	Rhode Island
Kansas	South Carolina
Kentucky	South Dakota
Louisiana	Tennessee
Maine	Texas
Maryland	Utah
Massachusetts	Vermont
Michigan	Virginia
Minnesota	Washington
Mississippi	West Virginia
Missouri	Wisconsin
Montana	Wyoming.

(See article on each)

Finance and Law

Though Congress is empowered by the constitution "to lay and collect taxes, duties, imports and excises," it imposes direct taxes only in war or in other exceptional circumstances. The national government derives its revenue almost entirely from duties on imports (see Tariff and Taxes) and from taxes on spirituous liquors, tobacco and other manufactures—especially on luxuries. In 1911 customs yielded $314,497,071; internal revenue $322,529,201; Coinage $5,272,347; public lands $5,731,637; the District of Columbia $7,060,080; tax on national banks $3,503,502; immigrant fund $3,669,816 and fees $5,131,157. The civil service (Congress, courts, the executive and the departments and the District of Columbia) cost $201,968,761; pensions $157,325,160; the army (including improvements of rivers and harbors) $162,357,100; the navy $120,728,786; and the Indians over $21,000,000. (See Army, Banks, Coinage, Consuls, National Debt, Navy, Patent-Office and Post-Office.) The revenues of the states, in distinction from the nation, come from direct taxation, and in the main are collected and spent by local authorities.

Taxes are now levied on incomes in the United States as they have long been in England, a constitutional amendment conferring upon congress the power to levy such taxes having been adopted in February, 1913.

The legal system of the United States is based on English law. Weights and measures also are English, but the use of the metric system is legalized. (See Corporations, Currency, Law, Metric System and Weights and Measures.)

Defence

Previous to the passage of the act of June 3rd, 1916, explained on page 108, the defense of the country was entrusted to a small army (called the regular army) and a navy and to a militia and naval reserve. (See Army, Coast-Defense, Military Schools, Militia, Naval Academy, Naval Reserve, Navy and West Point). Following the declaration of a state of war with Germany on April 6, what is known as the "Selective Conscription Bill" became a law May 18, 1917. It required all men from 21 to 30, inclusive, to register. From this registration enough men were selected to make up, with the forces of the regular army and national guard, the number of men required for service abroad. The selective feature of the law can best be expressed in the language of President Wilson: "The men who remain to till the soil and man the factories are no less a part of the army that is in France than the man beneath the battle flags."

Education and Religion

The constitution of the Union and the constitutions of the states guarantee the free exercise of *religion*, except where it opposes the constitution, and nowhere is there an established or state church. Every religion is represented — Budd-

hism, Confucianism, Islam and others as well as Christianity. In 1911 there were 35,836,190 communicants in the different churches; 221,197 organizations; and 172,431 ministers, the Catholics (of all bodies) numbered 13,004,012 communicants. (The Roman church numbered 12,575,085). The Methodists were the largest Evangelical body, all their branches together numbering 6,819,660 communicants. The Baptists came next (5,634,565), and Lutherans (2,289,897) and Presbyterians (1,944,181) contested the third place. Protestant churches are 14 times as numerous as Roman Catholic ones; their ministers 8 times as numerous; and their communicants more than double those of the latter. The Evangelical Sunday-Schools (*q. v.*) numbered over 192,700; their teachers 1,746,000; and their pupils 15,337,000. The Roman Catholic clergy estimate their Sunday-school scholars as 1,000,000. The Jews (*q. v.*) have 143,000 communicants; 1,769 churches; and 1,084 ministers.

Education is the business of the states, not of the nation, and every state has by law established free, public schools. These are largely supplemented by private and parochial schools. In 1910 only 7.7% of the 71,000,000 Americans ten years old and more were unable to read or write. These illiterates numbered 5,517,608. Only 3% of the native white population ten years old and more was illiterate; but 12.8% of the same class foreign-born whites and 30% of that class of the colored population were illiterate. That is, among the 50,989,343 of the first division there were only 1,535,530 illiterates; but among the 12,944,215 of the second class there were 1,650,519 illiterates and among the 7,646,712 of the third group there were 2,331,559 illiterates. Illiteracy in the United States is almost wholly due to immigrants and negroes. The percentage of illiteracy in 1900 was 10.7% and in 1910 7.7%. The United States leads the world in many industries, but in none more successfully than in the making of citizens in its public schools. Though the national government administers no system of education nor appropriates money directly for schools, it has ever since 1787 indirectly assisted education more generously than any other government that ever existed. In each new state it has set two square miles of each township six miles square aside as endowments for schools, agricultural colleges or universities. The total has been 75,000,000 acres for schools and universities, including 8,000,000 for colleges of agriculture. It also maintains a bureau of education (see DEPARTMENT OF THE INTERIOR), which collects statistics and publishes reports. The state systems of education are so similar that in effect they make a national system of American education. In 1909-10 there were 17,813,852 children in the public schools, which cost $426,250,434. The total number of pupils in *all* institutions was 19,811,922. Universities and colleges numbered 581, of which 339 were co-educational and 145 for men only. There also were 97 colleges for women The colleges and universities had 183,572 students and and an aggregate of 55,000,000 volumes in their libraries.

As for schools of music or art, almost every city has at least one. See COLLEGES, EDUCATION (MODERN), EDUCATION (STATE-AID), SCHOOLS and UNIVERSITIES; articles on other educational topics; and articles on the states and on single universities or colleges.

ART AND LITERATURE

See FINE ARTS, LITERATURE (AMERICAN) and SCULPTURE.

PEOPLE AND IMMIGRATION

The population of Continental United States in 1910 was 91,972,266. Including Alaska, Hawaii, Porto Rico and Philippine Islands, and adding estimates for the islands of Guam and Samoa and the Canal Zone, the total population of the United States and possessions is about 101,100,000. The original inhabitants were Indians (*q. v.*), of whom there are 291,581. The negroes (*q. v.*) were brought into this country in 1619 as slaves (see SLAVERY), and number over 10,000,000. Their progress since 1865 has been noteworthy. The native population of the continental United States in 1900 was 65,729,150, and the foreign-born 10,356,644. There were 160 cities of 25,000 or more inhabitants, their combined population being 19,718,312. The urban population (1910) was 42,623,383, or 46.3% of the total. In 1910 there were 50 cities with a population of 100,000 or more and 179 with 25,000 to 100,000 inhabitants. Among these chief cities are New York, Chicago, Philadelphia, St. Louis, Boston, Cleveland, Baltimore, Pittsburgh (including Allegheny), Detroit, Buffalo, San Francisco, Milwaukee, Cincinnati, Newark, New Orleans, Washington, Los Angeles, Minneapolis, Jersey City, Kansas City, Seattle, Indianapolis, Providence, Louisville, Rochester, St. Paul, Denver and Portland, Oreg., all but six east of the Mississippi and having from 4,766,883 down to 207,212 inhabitants. (See articles on cities of the United States as ADAMS or ZANESVILLE.) The foreign-born population in 1900 was 10,460,085, representing almost every nationality, 26,918,107 immigrants having come between 1787 and July 1st of 1908. (Canadian and Mexican immigrants are not included.) Before 1775 the English and Scotch-Irish were the prevailing race, though New York had a considerable Dutch and Pennsylvania a large German population, while South Carolina had many citizens of French descent. (The Louisiana of 1803 and Texas

and the southwest and California after 1848 added many French and Spanish inhabitants to the United States.) After 1820 immigration began to be considerable, the British predominating. In the 40's and 50's the Irish immigration first and then the German immigration assumed enormous proportions, the Irish settling chiefly in the eastern cities, the Germans on the western prairies. In the 70's the Scandinavian immigration became large, Maine, Minnesota and Wisconsin gaining many farmers from the storied Northland of Europe, and since 1890 Hungary, Italy, Poland and Russia have poured their millions in. In 1906-7, of 1,285,349 immigrants 338,452 or over a third came from Austria-Hungary; 285,731 were Italians; and 258,943 Russians (chiefly Jews). But in 1911 only 878,587 immigrants entered. Chinese are the only people excluded as a nation, though Japanese immigration is restricted, but all persons likely to become a public charge are also excluded by act of Congress (1882). In 1885 and 1903 more drastic laws were enacted, that of 1885 being later modified and in 1891 extended. (See CHINESE EXCLUSION and EMIGRATION.)

HISTORY

The story of our country naturally falls into three parts. These are the colonial period, the revolutionary epoch and the era of union. The first extends from 1576 to 1763; the second to 1789; and the third to the present day. But the first overlaps the second, because the revolution began while the United States was colonies; and the third runs back into the second, because American nationality and federal union began in revolution. Only the briefest account of American history can here be attempted. So it is suggested to the student, who wants to inform himself more fully, that he not only consult the articles named at the end of each paragraph but see articles on all the men and places and events mentioned within each paragraph itself.

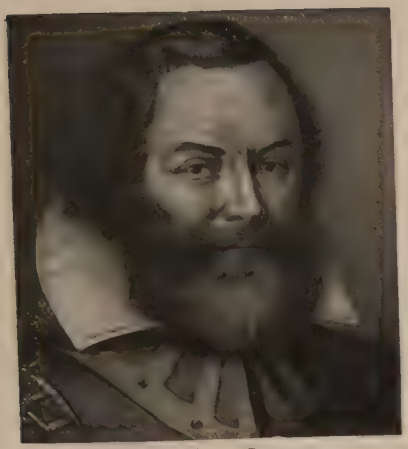
The Colonial Period. This is marked by colonization (1576–1750), by a struggle for expansion (1750–63) and by attempts at union (1763–75). English colonization began in 1585, when Raleigh planted settlements in North Carolina, and in 1602, when Gosnold placed colonists on islands off Massachusetts. It ended in 1733, when Oglethorpe founded Georgia. Permanent settlement came in 1607 in Virginia; in 1612 (by the Dutch) in New York; in 1616 in Maine; and in 1620 in Massachusetts. New Hampshire (1623); Maryland (1634); Connecticut and Rhode Island (1636); Delaware (1638, by Sweden); New Jersey (in 1640 by Swedes, before 1650 by Dutch and in 1664 by Englishmen); North Carolina (by Virginians before 1650, by English colonists in 1663); South Carolina (1670); and Pennsylvania (1661, though Swedes had founded settlements there in 1627 and Englishmen in 1641) successively became permanently settled. The separate histories of these colonies are given in articles under titles as above. They were governed by charters to the colonists or by proprietors or by the king, but all in effect were representative democracies. Life had all the hardships of existence in any new country, and these were increased by the difficulties of communication The southern planters, however, enjoyed a luxury that the middle colonies and New England could not then have. Nevertheless, as early as 1760 material prosperity abounded everywhere. In New England education was general; in the central colonies special classes had good education; and in the south the better class received education of a high order. Six colleges — Harvard, William and Mary, Yale, Princeton, Pennsylvania and King's (now Columbia) — were founded before 1760. Religious freedom prevailed to an exceptional extent. Thirteen governments (Maine being included in Massachusetts and Vermont in New Hampshire and New York) stretched from French Canada to Spanish Florida and from the Atlantic into the Appalachians. Their people numbered 1,250,000; had tamed the wilderness; had survived many struggles with the Indians; and were beginning to swarm across the mountains into the fertile valleys of the west. They were not unaware of their power. In 1690 and in 1710 New England had captured Port Royal, Nova Scotia, from France, and in 1745 it took Louisbourg, the strongest of American fortresses, on Cape Breton Island. But the colonists feared France in Canada (*q. v.*) and the French alliance with the Indians of the west. In 1749–54 came the crisis in the conflict for the continent, when the Virginians entered the Ohio Valley at Pittsburgh and Washington (1755) fought with and surrendered to the French. (See FRENCH AND INDIAN WAR.) In 1763 France ceded its American possessions (except New Orleans) from the Mexican Gulf to the Arctic Ocean and from the Appalachians to the Mississippi to Great Britain. It also ceded the Louisiana country between the Mississippi and the Rockies to Spain. So the colonists made good their claim to the eastern half of the Mississippi Valley, and cleared the way for the march of the Americans of the 19th century from the Atlantic to the Pacific. The French and Indian War showed the colonies their full strength, trained the soldiers and generals of the War for Independence and first united all the colonies. But its last result was to kill all sense of dependence on England. (See ALBANY CONGRESS; ANDROS; BACON, NAT.; BALTIMORE, LORD; BERKELEY, WM.; BLUE LAWS; BOONE, DAN.;

Braddock, Ed.; Carteret, Geo.; Claiborne, Wm.; Colleges; Culpeper; Delaware, Lord; Endicott; Gosnold; Indians; Jamestown; Louisbourg; La Salle; Penn; Pilgrims; Pontiac; Puritans; Raleigh, Sir W.; Smith, Capt., of Virginia; and Seven Years' War.

The Revolutionary Epoch. The English government, to repay the expenses of the war with France, taxed the American colonies heavily. Since 1651 it had hampered their commerce and manufactures, and Parliament's legislation was one of the direct causes of the American Revolution, but acts in restraint of trade were not vigorously and universally enforced until 1761. The colonists acknowledged that it was only fair that they should pay their share of the cost of their protection by England, but denied that Parliament, in which they were not represented, had the right to tax them. In 1761 Otis of Massachusetts declared that "an act of Parliament against the constitution is void," and the colonists resisted Parliament's writs of assistance.

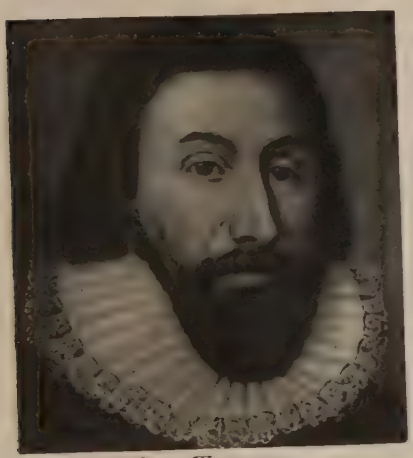
In 1765 Parliament passed a stamp-act that taxed the colonists without their consent, devoted the American revenue to the support of a standing army, and intended this army to maintain taxation. The Virginian assembly, the people's house of the legislature, declared that each colony had the right to make its laws and to lay and spend the taxes; the Massachusetts assembly proposed an American congress of representatives from every colony, appointing a committee to secure united action. The congress met, and appealed to the king and Parliament. The stamp-act (*q. v.*) was repealed, but American imports were taxed (1767) and the British authorities goaded the colonists further and further. In 1773 the colonial legislatures appointed "committees of correspondence" to keep up union of action with one another. A national spirit had been born. When the people of Boston threw a cargo of tea into the water, "the whole continent applauded." In 1774 Boston was closed to commerce and the charter of Massachusetts changed. These acts of the British government made war only a question of time. They crystallized every element of union in the colonies. The Virginians suggested, and the men of Massachusetts called, another congress which met at Philadelphia in September of 1774. This was the first continental congress (*q. v.*), the first really national body in American history. It addressed the English people and the king, and issued a Declaration of Rights of the colonists. It approved Massachusetts' opposition to Parliament and resolved that, if execution of the acts "*by force* "should be attempted, "all America ought to support their opposition." Congress summoned a new Congress which convened at Philadelphia in May of 1775. The British government now ordered General Gage to reduce the colonies to submission, and he at once took possession of Boston Neck and fortified it.

On April 19, 1775, at Concord and Lexington, Mass., war began, and with it the national existence, politically, of the United States. The people's or lower house of every colony took the government. Congress met as the representative of an united people, and all the colonists supported Massachusetts. The articles of association had already substituted government by the people for government by the legislatures, and the general union affected all our after history. Congress was sustained by the united people without regard to colonial governments, but did not take the national powers that were within its grasp. Congress adopted the Massachusetts miltia around Boston as the nucleus of the national army, and Washington was appointed its commander-in-chief. The day of his being commissioned is the day of the battle of Bunker Hill, which was one of the decisive battles of the war, because it showed that American soldiers would stand their ground. In March of 1776 Washington compelled the British to quit Boston. The war was unpopular in England, the British fighting but half-heartedly till 1778. In June of 1776 Richard Henry Lee of Virginia moved that Congress declare independence, and in July it "resolved that these united colonies are and of right ought to be free and independent states; that they are absolved from all allegiance to the British crown; and that all political connection between them and Great Britain is and ought to be totally dissolved." On July 4 Jefferson's Declaration of Independence was adopted by Congress, and the United States' legal existence began. Meanwhile the war was going against the new nation, for Washington was driven out of Long Island, New York and New Jersey, and the British controlled the Hudson's mouth. But on Dec. 26, 1776, at Trenton, N. J., Washington struck the blow that proved the turning-point of the war, and on Jan. 4, 1777, he made Morristown, N. J., his headquarters, and there these really remained through almost all the rest of the war. De Kalb of Germany, Kosciusko of Poland and La Fayette of France already were serving in the American army; Pulaski and Steuben came later; and in 1777 Franklin in France made the government in all but name an ally of the United States. On Oct. 17, 1777, Burgoyne, a British general who had tried to cut off New England from the other colonies by coming down the Hudson from Canada, was forced to surrender his army at Saratoga. This success won the United States a treaty of alliance with France. Howe captured



CAPTAIN JOHN SMITH

POCAHONTAS



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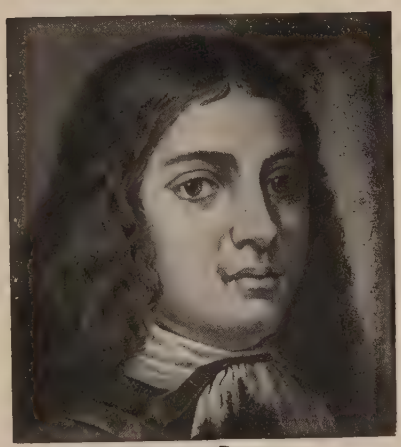

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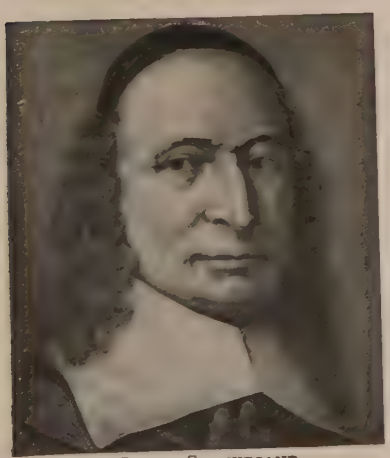

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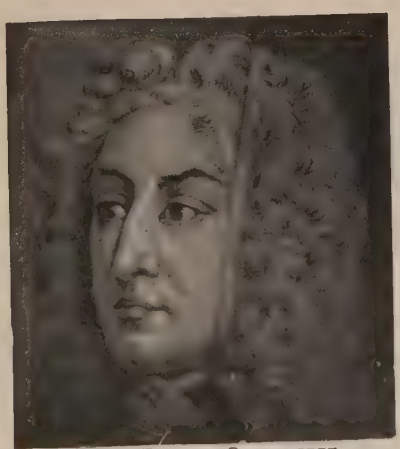

JAMES EDWARD OGLETHORPE

EMINENT CHARACTERS OF COLONIAL PERIOD

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Philadelphia, the capital, in 1777, and Washington, though he had made his army capable of taking the offensive, spent a terrible winter at Valley Forge, Pa. In the summer, however, of 1778 the end began. There were no more important events at the north, except unsuccessful attempts to recover Newport, R. I., Wayne's capture of Stony Point and Arnold's treason at West Point; for Washington at Morristown, N. J., watched New York and protected Philadelphia. In the winter of 1778–9 Clark of Kentucky, under the authority of Virginia, won the west for the United States. The English, hopeless of success in the north and east, transferred the war to the south, mistakenly imagining that the slaves would rise against their masters. In 1778 they captured Savannah and Georgia, in 1780 Charleston and South Carolina. But Greene, the only great American general developed by the war, except Washington, saved the south (1781), though never winning a battle, and he was ably seconded by Morgan, Marion and Sumter. The English held only Charleston, New York City and Savannah, and the country at large had long been at peace. In June of 1781 Cornwallis chose Yorktown, Va., as a permanent post on Chesapeake Bay. But Washington, watching Clinton at New York, had been reinforced by 6,000 French troops. A French fleet was to enter the Chesapeake. Washington deceived Clinton into thinking that he was to attack New York City. Clinton weakened Cornwallis by withdrawing part of his troops. Washington moved down the Hudson, kept Clinton in ignorance to the last moment, suddenly swung aside through New Jersey and Philadelphia, and hurried the allied armies down Chesapeake Bay. The French fleet had early in September driven off the British fleet supporting Cornwallis. The American and French armies invested his position in front, the French fleet his rear. Besieged and starved, the English fleet unable to reach him, he surrendered on Oct. 19, 1781. "My God!" cried Lord North, when the news reached him, throwing up his hands; "it is all over." It was. The moral effect of the capture of Cornwallis practically ended the fighting. On Nov. 30, 1782, Great Britain acknowledged the independence of the United States, and on Sept. 3, 1783, peace was definitively concluded. (See ADAMS, JOHN; ADAMS, SAM.; ANDRÉ; ARNOLD, BENEDICT; BUNKER HILL; BURGOYNE, JOHN; CINCINNATI, SOC. OF; CLARK, GEO. R.; CORNWALLIS; DANE, NATHAN; DAUGHTERS OF THE REVOLUTION; DECLARATION OF INDEPENDENCE; FRANKLIN, BEN.; GREENE, NAT.; HAMILTON, A.; JEFFERSON, THOS.; LEE, R. H.; MORRIS, ROB.; OTIS, JAMES; PAINE, THOS.; PARLIAMENT; SARATOGA; TRENTON; VALLEY FORGE; WASHINGTON, GEO.; and YORKTOWN.)

The United States, which had first called itself by that name in the Declaration of Independence, began with a territory bounded on the north nearly as now, on the west by the Mississippi to the latitude of Florida and on the south by (then Spanish) Florida. But the country, though a union, was a confederated union, not a federal union. For in 1775–6 the colonies, as soon as imminent danger disappeared, deprived Congress of so much power that they endangered the nation's life. The new legislatures took the power of naming and recalling the delegates to Congress; the thought of nationality grew dim; and the colonies asserted that they were sovereign states. In 1777 articles (*q. v.*) of confederation were adopted which made the new nation merely "a firm league of friendship" between sovereign states. Congress at best hardly had more than advisory power. The states were to be sovereign in everything. The result was inefficiency in the management of public affairs. So, in 1787, "we, the people of the United States, in order to form a more perfect union" held a constitutional convention which met at Philadelphia. This was the ablest body that had assembled since 1775, and Washington presided. It formed the present constitution (which has already been described), nine states adopted it by June of 1788, and the new government began. This is the federal union, in which the people are the sovereign. New York was made the capital, Washington elected president unanimously and John Adams made vice-president (1789).

In 1787, too, the continental Congress had passed an ordinance, the famous Ordinance (*q. v.*) of 1787, in regard to the new lands of the United States between the states and the Mississippi, the states having ceded their lands there to the United States. These lands played no small part in bringing about the federal union, and the ordinance proved of immense importance to the future of the United States and to its politics.

It is difficult to realize how poor and weak our country was. It owed $42,000,000, but numbered only 3,929,214 people. It was an almost exclusively agricultural country. Communication was slow and painful. Distances were immense when there were neither railroads nor steamships, and this increased the labor of administering such a country under a single government. The states were jealous of one another and of the Union. The people themselves had changed since 1775, and not for the better. The things that saved the nation were the picked men that led it and created a strong government; the keen and intelligent interest of its citizens in politics; and the outlet to the new domain in the west. The states yielded their claims here to the Union, free

navigation of the Mississippi was secured from Spain (1795), and emigration began to flow freely across the Alleghanies. The Federalist party controlled the first two Congresses, and organized the government much as it is to-day. Protection of American manufactures was begun, the national debt funded, the debts of the states being assumed as part of it, a national bank founded, and Washington City appointed to be the capital after 1800. John Adams was elected president and Thomas Jefferson vice-president in 1797. But the Federal party passed three laws about aliens and sedition that the Anti-Federalists (then called Republicans, but Democrats now) considered political persecution. In 1801 the Anti-Federalists came into power in the election of Thomas Jefferson as president. (See ALIEN AND SEDITION LAWS; HABEAS CORPUS; HISTORY; INDIANS; INTERNATIONAL LAW; JAY, JOHN; JURY, TRIAL BY; LANDS; MINT; MONEY; NATURALIZATION; NAVIGATION LAWS; NEUTRALITY; POLITICAL ECONOMY; POLITICAL PARTIES; POOR LAWS; PRESIDENT; PRESS, FREEDOM OF; PROTECTION; SUFFRAGE; TARIFF; TAXES; and WHITE HOUSE).

Meanwhile Vermont (1791), Kentucky (1792) and Tennessee (1796) had become states. Whitney (1793) had invented the cotton-gin, which made cotton-growing profitable and slave-labor apparently necessary, and so played a part in politics. "The West" had begun to be a factor in our growth, for the Indians of Ohio had been compelled to surrender their lands and the safety with which settlement could be made gave it a new impetus. The rising spirit of migration inspired the people to try to improve the communications, and attempts were made to introduce turnpikes and canals. Our population (1800) had become 5,308,483.

Jefferson, though believing that the constitution should be interpreted narrowly and the powers of the national government severely restricted, was forced by events to do things that not even the Federalists had done. He doubted if the nation had the right to buy and hold territory, but in 1803 he bought the Louisiana country, thus more than doubling the area of the United States. He also sent Lewis and Clark to explore the Oregon country. In 1805 the Barbary pirates were reduced to submission. In 1807 an embargo act forbade foreign commerce altogether, in order to starve Great Britain into fair treatment of the United States. It injured American commerce greatly, but did nothing else; and the relations between England and the United States grew more and more strained. Ohio had become a state in 1803; Fulton had made steam a commercial success in navigation (1807), so that within four years steamers plowed the western rivers and emigration crossed the Mississippi; and the slave-trade was abolished (1808). (See EMBARGO ACT; LEWIS AND CLARK; and LOUISIANA PURCHASE).

Madison succeeded Jefferson in 1809, and tried to carry out Jefferson's policy, but in 1812 had to declare war against England. The United States could no longer tolerate the British claim of sovereignty over naturalized American citizens, the claim to the right to search the ships of neutrals, the claim of a right to impress her subjects as seamen, wherever found. On land the war was disastrous, as a whole, for America, though the battles of Chippewa, Lundy's Lane and New Orleans were American victories; but at sea and on the lakes it was successful, the United States winning 15 out of 18 engagements. Peace was renewed on Dec. 24, 1814. Nothing was said about search and impressment, but Britain never again searched American ships or impressed American seamen. The war strengthened the national government and took the Democratic party to many of the positions of the Federalists. The supreme court, John Marshall of Virginia being chief-justice (1801–35), also took advanced positions in favor of the federal government. Protection to American industries was renewed, and inventive genius grew rapidly. By 1810 our population had grown to 7,239,881. Louisiana had become a state in 1812. (See EMIGRATION; HARTFORD CONVENTION; MARSHALL, JOHN; and TECUMSEH).

Madison was in 1817 succeeded by Monroe, and the old Democratic party became two parties (1825). Clay was the leader of the new Democracy, which called itself Whigs and took in the remains of the Federal party; Calhoun and Jackson of the party which now formally called itself the Democratic party. The westward movement of population was growing more and more, and Indiana, Mississippi, Illinois, Alabama, Maine and Missouri all joined the Union during 1816–21. The population (1820) had become 9,638,453. All our territory east of the Mississippi (except the northern part of the old northwest) had become states, Florida had been bought from Spain, and the Indians between Georgia and the Mississippi had ceded their lands and left this territory open for settlement. Commerce between the east and the west was facilitated in 1825 by the completion of the Erie Canal. In 1823 Monroe promulgated the Monroe doctrine.

John Quincy Adams (*q. v.*) in 1825 followed Monroe, being elected as a National Republican. He upheld the system of internal improvements and of protection to manufactures, the tariff of 1828 being extremely protectionist. (See ERA OF GOOD FEELING; MISSOURI; SLAVERY; and WHIGS).

Jackson became president in 1829. Cal-

houn of South Carolina held that any state, if it considered a law of Congress unconstitutional, might suspend or nullify it. South Carolina declared the tariff of 1832 null, but Jackson compelled it to repeal the ordinance of nullification. He also deprived the United States Bank of the public funds. During 1829–37 all the machinery of American political parties came into being. In 1826 the railroads had begun and they made the growth of the west far more speedy. Our population in 1830 was 12,866,020. Anthracite was now at last used with commercial success. Steam navigation across the Atlantic was established (1838), the telegraph came in 1844, and the modern era of the United States opened. In 1835 the public debt was extinguished, and the surplus distributed among the states. In 1837 came a serious financial panic. (See BLACK HAWK; CALHOUN, JOHN C.; CLAY, HENRY; CROCKETT, DAVY; HAYNE, R. Y; HOUSTON, SAM.; JACKSON, ANDREW; JOURNALISM; KENT, JAMES; NEWSPAPERS; SOUTH CAROLINA; STATES' RIGHTS; TEXAS; STORY, JOS.; and WEBSTER, DANIEL.)

Van Buren succeeded Jackson in 1837, and replaced the national bank by the government treasury, but the hard times enabled the Whigs to elect William Henry Harrison. As he died soon after his inauguration (1841), Vice-President Tyler became president, and the Democrats rather than the Whigs ruled. They then elected Polk (1845–9) and Texas was annexed in 1845. War with Mexico followed (1846–8), America took possession of California and New Mexico, and Taylor and Scott won every battle with the Mexicans. Peace was concluded in 1848, Mexico ceding what now are Arizona, California, New Mexico, Nevada and Utah. The United States paid Mexico $15,000,000 and assumed $3,000,000 of Mexican debts to American citizens. At the same time (1844–6) the United States obtained the Oregon country (between the Rockies, Canada, the Pacific and California, Nevada and Utah) from England. Texan annexation had added 375,000 square miles to the country, the Mexican cession 500,000 and the Oregon country about 250,000. The United States, when the Gadsden purchase (1853) rectified the frontier between Mexico and New Mexico, had taken the dimensions it retained till 1867. (See CALIFORNIA; COMPROMISE OF 1850; FUGITIVE SLAVE LAW; GADSDEN PURCHASE; MEXICAN WAR; MEXICO; MORMONS; OMNIBUS BILL; and UTAH.)

But the discovery of gold in California (1848) and the non-existence of slavery in the Mexican lands brought political troubles. The Missouri compromise (1820) had prohibited slavery (except in Missouri) in the Louisiana country north of 36° 30′. Agitators at the north at once opened public opposition to slavery, and in 1831 a movement for the abolition of it began. (See EMANCIPATION, GARRISON and PHILLIPS.) In 1820 the south and the north had already drifted apart in their views as to slavery, state sovereignty and the Union. New economic conditions controlled the north and the west, which the south hardly felt, and these widened the gulf between the sections. California applied for admission as a state, and forbade slavery. If it and other states from the new territory were to be free states, the slave-states would lose power and slavery would be endangered. In 1850 California was admitted as a free state, but a fugitive-slave law was passed.

Since 1830 material development had been extraordinary. The sudden increase of wealth gave fresh impetus to the spirit of invention. Goodyear's method of vulcanizing rubber (1839) came into universal use. McCormick invented the reaper (1834), which has been hardly less important to the country than the railroad, enabling it to fill the west rapidly and making western farms profitable. In 1846 came the power-loom, a successful sewing-machine and the surgical use of anesthetics. Next year brought the rotary press for printing. In 1847, too, European immigration first became an important factor in the making of the country. Its population in 1840 was 17,069,453. In 1850 it had become 23,191,876.

The Whigs elected Taylor (1849), who, however, died in July of 1850 and was succeeded by Fillmore. The Democratic party had put forward the doctrine of squatter sovereignty or the proposal that the people of each territory be left to settle the question of slavery for themselves. The Whigs had ignored or evaded the problem. In 1854 Kansas and Nebraska were organized as territories, both being in territory where the Missouri compromise had prohibited slavery. The compromise was now repealed and the question of slavery was left to the people of these territories. The south and the north vied to see whether these people should be southerners and favor slavery, or northerners and favor freedom. Civil war in Kansas ensued, but the antislavery settlers were in a large majority and Kansas finally (1861) became a free state. Meanwhile a new party, an antislavery party only so far as it aimed to exclude slavery from the national territory, had arisen and had captured the popular branch of Congress. The Democratic party, which since 1852 had practically been the sole party, was faced by the Republican party. (See CHASE, SALMON P.; DAVIS, JEFFERSON, DOUGLAS, S. A.; KANSAS; LINCOLN, ABRAHAM; SEWARD, WM. H.; STANTON, E. M.; SUMNER, CHAS.; and UNDERGROUND RAILROAD.)

The Democrats had elected Franklin

Pierce (1853) and in 1857 James Buchanan, another Democratic president, succeeded him. In 1857 Chief-Justice Taney of the Supreme Court decided that the national constitution considered slaves, not persons, but property; that the Missouri compromise had been unconstitutional; that Congress was bound to protect property; and that Congress, therefore, ought to and must protect slavery in the national territory. The south maintained that its view as to the duty of Congress was confirmed, the north flouted the decision (the Dred Scott decision), and disunion came in sight. But the south and the north had so diverged in population, resources and wealth, that in 1860 the free states were 19,000,000 to the slave states' 12,000,000. (The total population was 31,443,321.) The Democratic party split in 1860, the northern or Douglas Democrats resting on squatter sovereignty and the compromise of 1850, but willing to accept the decision of the Supreme Court, the southern Democrats demanding protection from Congress for slavery in the territories. The Republicans demanded that Congress prohibit slavery in the national domain. Abraham Lincoln, their candidate, was elected. South Carolina on Dec. 20, 1860, seceded and prepared for war, and by Feb. 1, 1861, had been followed by Mississippi, Florida, Alabama, Georgia, Louisiana and Texas. On Feb. 4 they formed the Confederate States. In the spring North Carolina, Arkansas, Virginia and Tennessee joined the Confederacy. On April 14, 1861, South Carolina attacked Fort Sumter, and the Civil War began. It closed on April 9, 1865, at Appomattox, Va. It had engaged 2,780,000 Federal and 1,000,000 Confederate troops; cost 500,000 lives; encumbered the nation with a debt of $2,800,000,000; and almost ruined the south.

For details of this bitter and exhausting struggle the reader is referred to accounts (under proper titles) of the important battles, as Bull Run, Donelson, Shiloh, Stone River, Antietam, Fredericksburg, Gettysburg, Vicksburg, Chickamauga, the Wilderness, Spottsylvania, Mission Ridge and Atlanta, as, also, to sketches of the great leaders, as Lincoln, Grant, Sherman, Thomas, Sheridan, Logan and others of the Federal side and Davis, Lee, Beauregard, Johnston, Jackson and others of the Confederates. It should be noted, however, that, while the final issue was determined in the results of these great battles, any adequate understanding of the intensity and strain of this titanic struggle must be sought in the story of hundreds of minor engagements, for the record shows that during 1862–4 every day saw a clash of arms, and it is a literal fact that the roar of artillery and the rattle of musketry did not cease for one day during these dreadful years. (See CONFEDERATE STATES; DECORATION DAY; DRAFT RIOTS; EMANCIPATION PROCLAMATION; JOHNSON, ANDREW; KUKLUX KLAN; NEGRO EDUCATION; PEACE SOCIETIES; RECONSTRUCTION; REPUBLIC, GRAND ARMY OF THE; and THANKSGIVING DAY).

Reconstruction ensued, and on Jan. 30, 1871, the last of the seceding states was recognized and reinstated by Congress. On Jan. 1, 1863, the proclamation of emancipation from slavery had been issued; in 1865 the thirteenth amendment to the constitution abolished it forever; and in 1870 the fifteenth amendment was adopted, which provided that "the right of citizens of the United States to vote shall not be denied or abridged by the United States or by any state on account of race, color or previous condition of servitude." By 1897 the debt, in spite of enormous pensions yearly to survivors from the Federal forces, had been reduced nearly half. In 1867 Alaska had been purchased from Russia and France had been compelled to withdraw from Mexico, which was thus enabled to overthrow Maximilian.

Andrew Johnson, who had been made president by Lincoln's death, was succeeded in 1869 by General Grant. During his administration the *Alabama* claims against England were settled by arbitration in favor of the United States, the Union and Central Pacific Railroads were completed, the civil service was reformed, the panic of 1873 occurred, and the centenary of the independence of the United States was celebrated by an international exposition. In 1870 the population had grown to 38,558,371. (See ALABAMA CLAIMS; ARBITRATION; EXPOSITIONS; LABOR; LABOR PARTIES; PEONAGE; RED CROSS SOCIETIES; SPECIE PAYMENTS; and WOMAN'S RIGHTS.)

In 1877 Rutherford B. Hayes was inaugurated president. He immediately withdrew the last Federal troops from the south, and the government of the southern states by the negroes and by northern office-holders ceased. Specie-payments were resumed. James A. Garfield succeeded him in 1881, but was assassinated, Vice-President Chester A. Arthur succeeding to the presidency. Chinese immigration and polygamy were prohibited. By 1880 the population had become 50,155,783.

The Democratic party came into power again in 1885, when Grover Cleveland became president. He extended the reform of the civil service to a great number of offices, and urged radical changes in the tariff. Another antipolygamy law and another bill for the exclusion of the Chinese were passed. The succession to the presidency was regulated, as was also interstate commerce. (See IMMIGRATION BUREAU; INHERITANCE TAX; INTERSTATE COMMERCE; RECIPROCITY; SINGLE TAX; STRIKES; and TRADE-UNIONS.)

The Republicans elected Benjamin Harrison (1889-92) as Cleveland's successor. Commercial and political relations with Central and South America were strengthened and extended, as was the policy of reciprocity, though a high tariff was enacted. The pension system was enlarged, the law for free coinage of silver repealed and another for limited coinage substituted. A revolution occurred in Hawaii, the native monarchy was overthrown, and the new government applied for annexation to the United States. Congress passed a bill for the annexation of Hawaii, but Cleveland was elected again, and annexation did not occur until 1898. In 1890 our people numbered 62,947,714. (See HAWAII; and INCOME TAX.)

Cleveland's second term opened with the financial panic of 1893, the establishment of a low tariff and efforts to restore Hawaii to its native rulers. A dispute between Great Britain and Venezuela was settled at the instance of the United States by referring it to a tribunal of arbitration. The fourth centenary of the discovery of America was celebrated by the Columbian Exposition. The difficulty with England and Canada as to sealing in Bering Sea was settled amicably. The president extended the reform of the civil service, and used Federal troops to suppress a strike that interfered with interstate commerce.

The Republican party returned to power by the election and reëlection of William McKinley (1897-1901) and the succeeding elections of Theodore Roosevelt (1904) and William Howard Taft (1908). The political and financial question in 1896 was whether the United States should adopt gold alone or gold and silver as its monetary standard, and in 1900 gold was by law established as the standard of currency. A high tariff was also restored. In 1898 war with Spain broke out, and resulted in the acquisition of Porto Rico and the Philippines (*q. v.*). In 1900 the United States joined the powers of Europe in suppressing a rebellion in China. On Sept. 6, 1901, President McKinley was assassinated, and Vice-President Roosevelt (*q. v.*) became president. The eight years of his presidency were marked by great prosperity and expansion and by the advance of the nation to commanding position as a world-power. Among important affairs demanding the attention of Congress and the executive were the building of Panama Canal (*q. v.*); the reclamation of great areas of arid lands by irrigation (*q. v.*); the husbanding of the national resources through the cultivation of forests and the establishment of forest-reserves (*q. v.*); the promotion of the welfare of the Filipino; the occupancy of Cuba (*q. v.*) and the reëstablishment of its republic; the righting of abuses in the management of railroads and other great corporations; the completion of the Pacific cable; the creation of the Department of Commerce and Labor; the signing of a treaty of arbitration with Germany; financial control of Santo Domingo; the foundation of an American institute for the promotion of industrial peace between capital and labor; and the Pan-American Congress. In November of 1908 the United States entered into an agreement for maintenance of national integrity and an open door in China. The most important political events and legislative acts of the next four years are summarized in the article on Mr. Taft, who was succeeded by Woodrow Wilson, whose administration was distinguished by such constructive legislation as the 16th amendment, permitting the enactment of the Federal Income Tax; the amendment providing for popular election of senators; the Clayton Anti-Trust Law; the federal banking system; the Federal Trade Commission and the Selective Conscription Law (*v. p.* 1975) following the beginning of the war with Germany. (See TRUSTS and INCOME TAX.)

BOOKS FOR READING

Colonial Period (*to* 1760). Among general histories, which cover not only this period but others or the whole course of American history, the student should consult The American Commonwealth Series and the works of Bancroft, Bryant and Gay, Gilman, Higginson, Hildreth, McMaster, Rhodes, Schouler, Von Holst and Winsor. Histories that deal specially with the colonies consist, among others, of Dodge's *English Colonies*, Doyle's *English Colonies*, John Fiske's works (named in the article on Fiske), Lodge's *English Colonies*, Marshall's *History of the Colonies*, Neill's *English Colonization*, Palfrey's *History of New England* and Parkman's works. The articles in this work on the separate states of the Union often mention books of reference. Nor should American chapters in *The Cambridge Modern History* be forgotten.

Revolutionary Era (*to* 1789). Channing and Hart's *Guide to the Study of American History* is helpful to start the study of the Revolution. Other helps are Fiske's *American Revolution* and *Critical Period of American History;* Carrington's *Battles of the Revolution;* Chalmers' *Revolt of the Colonies;* Dunning's *Political Theories;* Frothingham's *Rise of the Republic;* Hamilton's *Federalist;* Ludlow's *War of Independence;* Merriam's *American Theories;* Scott's *Constitutional Liberty;* Story's *Commentaries;* Sullivan's *Antecedents of the Declaration;* Willoughby's *Nature of the State;* and Winsor's *Reader's Handbook.* Lecky's *History of England* and Trevelyan's *American Revolution* give the English views.

The National Era (*to date*). Consult Bancroft (Geo.): *History of the Constitution;* Bancroft (H. H.): *The Pacific States;* Ben-

ton: *Thirty Years' View;* Blaine: *Twenty Years of Congress;* Bryce: *The American Commonwealth* (student's edition); Curtis: *History of the Constitution,* Davis, Jefferson: *The Rise of the Confederate Government;* Ely: *The Labor Movement;* Fiske: *American Political Ideas;* Foster: *A Century of American Diplomacy;* Hart: *Foundations of American Foreign Policy;* Jameson: *The Constitutional Convention;* Johnston (A.): *American Politics;* Kent: *Commentaries;* Lamphere: *American Government;* Macy: *Civil Government, Institutional Beginnings, Our Government* and *Political Parties;* Morse: *Citizenship;* Richardson: *Messages and Papers of the Presidents;* Roosevelt: *Naval History* and *The Winning of the West;* Stephens, A. C.: *The War Between the States;* Taussig: *Protection;* The Century Co.: *Battles and Leaders of the Civil War;* and Wilson, H. H.: *The Rise and Fall of the Slave-Power.* The American Statesmen Series also should be consulted; the writings of public men, as Grant or Washington; and public or official documents as well as such statistical works of private individuals as *The Statesman's Year-Book.* FREDERIC PERRY NOBLE.

Uni'ted States, Depart'ments of. There are ten departments of the executive branch of the government of the United States, of which the president is the head. The heads of the departments, known as secretaries, are appointed by the president, subject to confirmation by the senate. The continental congress had established a post-office department before July 4, 1776, and afterwards established departments of foreign affairs, of the treasury and of war. The secretaries have a salary of $12,000 a year each, but no seats in Congress, and form the president's cabinet or board of advisers. The heads of the departments are the secretary of state, secretary of the treasury, secretary of war, secretary of the navy, secretary of the interior, secretary of agriculture, secretary of commerce and labor, postmaster-general and attorney-general.

Department of State. The department of state, first called the department of foreign affairs, has charge of all the relations and business of the United States with foreign nations. The divisions or bureaus as they are called are the diplomatic bureau, consular bureau, bureaus of statistics, accounts, archives, library, trade, appointments and passports. There are four classes of ministers sent to foreign countries to represent the United States: ambassadors extraordinary, ministers plenipotentiary, ministers resident and *chargés d'affaires* (persons in charge of affairs). In the principal foreign cities are stationed consuls (*q. v.*) or governmental agents, who look after the interests of Americans, residents or travelers, and especially American seamen. The principal officers of the department of state, besides the secretary, are three assistant-secretaries, eight heads of bureaus, one solicitor, two assistant-solicitors and one chief clerk. (See NATURALIZATION.)

Treasury Department. The largest and most important department is that of the treasury, which was formed in 1789. The secretary of the treasury has to superintend the collection of revenue, to grant warrants for money used in carrying out the appropriations of Congress, to oversee the public debt, national banks, coinage, internal revenue etc. There are three assistant-secretaries; eight division-chiefs; two comptrollers; a chief clerk; and six auditors. There also are a treasurer of the United States, who has charge of all public money and pays it out only on orders from the secretary of the treasury; an assistant-treasurer; a register of the treasury, who keeps the accounts; a deputy-register; a commissioner of internal revenue; a director of the mint, assisted by two deputies; a chief of the bureau of engraving; an actuary and a surgeon-general; the supervising architect; two solicitors; and a chief of secret service. The director of the mint holds his place for five years, and has charge of the mints and assay-offices. The chief of the bureau of engraving and printing has the oversight of the printing and engraving of all United States bonds, bank-notes etc. and the printing of all public documents, reports etc. The internal-revenue bureau has charge of the collecting of government taxes; the life-saving service has charge of the appliances for the saving of life and property on all our coasts; and the architect has charge of all building, repairs, construction etc. The bureaus of statistics and navigation, the coast-survey, steamboat-inspection etc. formerly belonging to the treasury department, were transferred to the department of commerce and labor when that department was established in 1903. Full reports are required of all the officers of the treasury. (See LIFE-SAVING SERVICE.)

The Department of War. The president is commander-in-chief of the army, but never acts in that capacity, and makes all communications to it through the secretary of war. The army is directly under the control of the secretary of war, with the aid of an assistant secretary and the chief-of-staff of the army. (See ARMY.) The war department, through its secretary, reports on the state of the army, the necessary expenses etc., and also has charge of the improvements of rivers and harbors. The military secretary has charge of the recruiting and mustering of soldiers and records of the army; the inspector-general examines arms and the drill and discipline of the army; the judge-advocate-general is in charge of the bureau of military justice;

The Story of Washington in Art

By Permission of Taber-Prang Art Co., Springfield, Mass.

Washington and His Mother, by L. E. Fournier (French b. 1839)

THIS picture shows Washington visiting his mother after the final triumph of the American army at Yorktown. Mother and son had not seen each other for seven years. "She welcomed him," says Lossing, "with a warm embrace, called him 'George,' spoke much of old times and friends but said never a word of his glories. He was simply her good son George who had done his duty."

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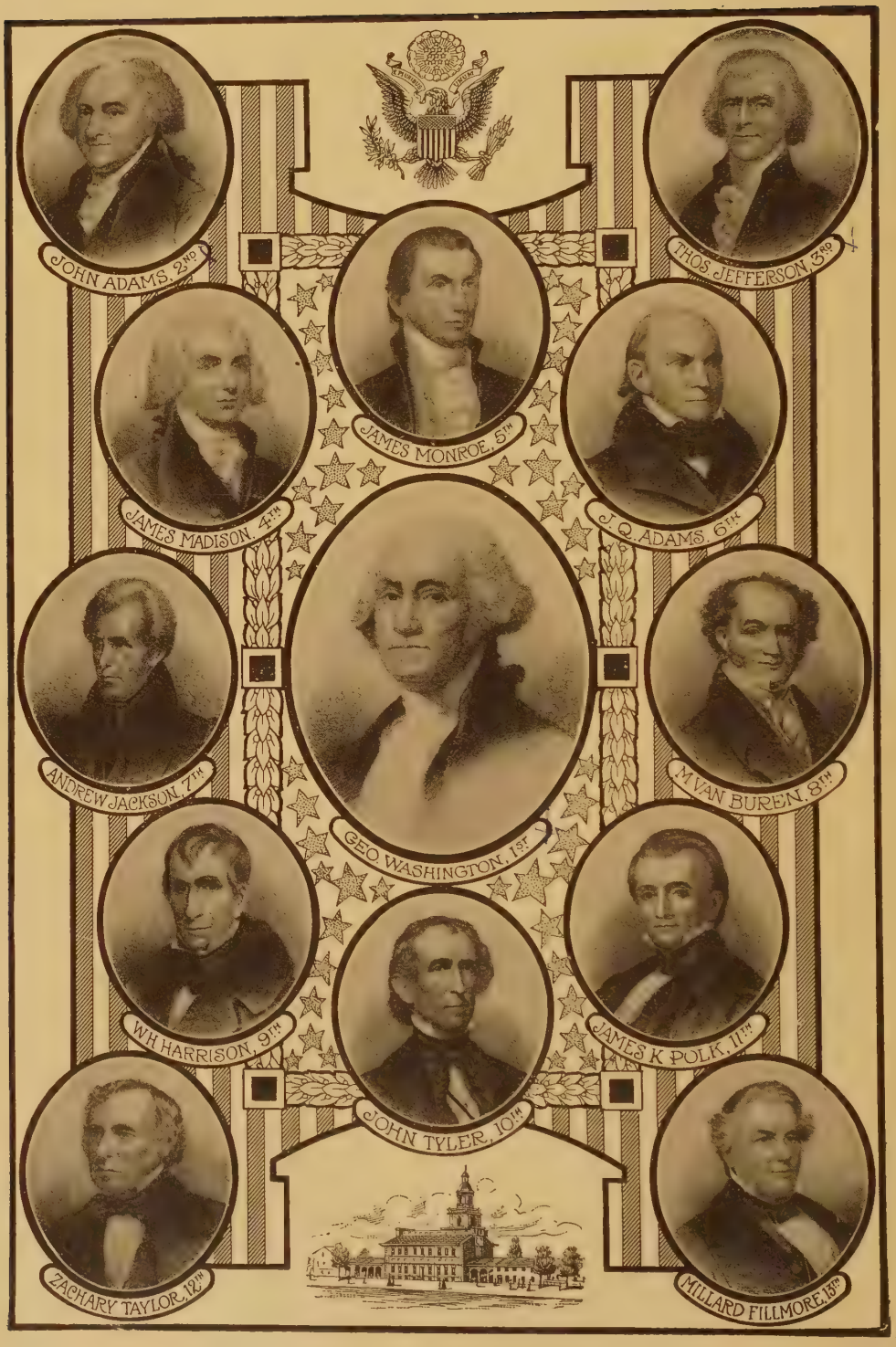
Washington in Headquarters at Newburgh, by Jennie Browncombe (American b. 1850)


JOHN ADAMS, 2ND
THOS JEFFERSON, 3RD
JAMES MONROE, 5TH
JAMES MADISON, 4TH
J.Q. ADAMS, 6TH
ANDREW JACKSON, 7TH
GEO WASHINGTON, 1ST
M VAN BUREN, 8TH
WH HARRISON, 9TH
JAMES K POLK, 11TH
JOHN TYLER, 10TH
ZACHARY TAYLOR, 12TH
MILLARD FILLMORE, 13TH

FRANKLIN PIERCE 14TH
JAMES BUCHANAN 15TH
U.S GRANT. 18TH
ANDREW JOHNSON 17TH
R.B.HAYES. 19TH
J.A GARFIELD 20TH
A.LINCOLN. 16TH
CHESTER A ARTHUR 21ST
BENJ. HARRISON 23RD
G.CLEVELAND. 22ND
W.McKINLEY. 24TH
T.ROOSEVELT. 25TH
W.H.TAFT. 26TH
WOODROW WILSON 27TH

Story of Lincoln in Art

© *Gutzon Borglum. By Permission of the Artist.*
Lincoln, by Gutzon Borglum (American b. 1867)

© *Horace K. Turner Co., Boston*
Lincoln's Boyhood, by Eastman Johnson (American b. 1824)

THIS page shows how three eminent American artists have told about the life and character of Lincoln. Johnson shows him laying the foundations of his greatness. In the quaint language of Lincoln's cousin, and playmate, Dennis Hanks: "Seems now I never seen Abe after he was twelve 'at he didn't have a book some'rs-'round. A'nt Sairy'd never let the children pester him. She always sed Abe was goin' to be a great man some day an' she w'an't goin' t' have him hendered." This painting is in the library of Berea College, Berea, Ky.

After you study his picture turn to Mrs. Atkinson's biography of Lincoln on page 1073 and you will find a list of some of the books Lincoln read. And there you can read again his immortal Gettysburg's speech and of the simple, quiet way in which it was delivered. The sculptor has caught with his wonderful skill the very spirit of the occasion and the man. This statue is at Lincoln, Neb. French's work is noted for its serenity and distinction and his intense sympathy with his subject.

The work of both French and Borglum has given them a place among the most eminent of modern sculptors. The Lincoln head is in the capitol at Washington. As you look at this face, can you not read the same thought contained in our biography of Lincoln:

"He had the brain of a sage, the forehead of a prophet, the inflexible purpose of the reformer, the tender heart of a mother."

Lincoln at Gettysburg, by D. C. French (American b. 1850)

and the signal-officer, in charge of the signal-service, which oversees the seacoast service; the quartermaster-general, with the duty of providing the army with supplies; the commissary-general, who sees to the rations or food of the army; the paymaster, who keeps accounts; and the surgeon-general are important officers of the department. There also are an ordnance department and an engineer corps, the chief of ordnance and the chief of engineers being very prominent and important officers. This department also has a bureau of insular affairs, a custodian of public buildings and a landscape-gardener, while every division or bureau named also has a head-clerk. (See QUARTERMASTER and SIGNAL-SERVICE.)

Department of the Navy. The navy has one admiral and 155 rear-admirals, 20 of whom are in service. The grade of commodore on the active list has been abolished from the navy. The navy department was not formed until 1798, and has eight bureaus of yards and docks, navigation, ordnance, construction and repairs, equipment and recruiting, provisions and clothing, steam engineering, medicine and surgery. The duties of the heads of these departments, three of whom rank as rear-admirals while in office, are similar to those of the war department, and are sufficiently indicated by the name of the bureau. (See NAVAL ACADEMY, NAVAL OBSERVATORY, NAVY and OBSERVATORY.)

The Postoffice Department. The postoffice department, permanently established in 1794, has, besides the postmaster-general, four assistant-postmasters, each with a corps of superintendents and assistants. The first assistant-postmaster has charge of the money-order system and the dead-letter office (*q. v.*), where all unclaimed mail is sent, the free delivery system and the location of new offices. The second assistant arranges the mail service, making contracts, furnishing bags, locks etc. The third assistant has charge of the making and distributing of stamps, postal cards, wrappers, the collection of revenue from postoffices and other financial operations. The fourth assistant has charge of post-office inspectors, receives applications for postmasters, issues their commissions, and investigates losses by mail. See POST-OFFICE.

The Department of the Interior. The department of the interior was formed in 1849, and has charge of public lands, Indians, pensions, patents, education, the census and geological survey. There are two assistant secretaries; a commissioner of public lands; a commissioner of pensions, with the oversight of 18 pension agencies; the commissioner of Indian affairs, with a board of ten commissioners and 70 agents; the commissioner of patents, of education and of the geological survey and the reclamation service. (See CENSUS, EDUCATION, GEOLOGICAL SURVEY, INDIANS, PATENTS, PENSIONS, SMITHSONIAN INSTITUTE, SURVEYING and TRADE-MARK.)

Department of Agriculture. The agricultural department, formed in 1889, has charge of experimental stations where new plants are tested, of the distribution of rare seeds and plants, the collection of statistics, the study of animal diseases and insect pests, weather observations etc. (See FOREST-SERVICE, NATIONAL PARKS and SIGNAL-SERVICE.)

The Department of Commerce has charge of the interests of commerce, trade and manufactures; also of the census, of statistics, of steamboat service and navigation. The Federal Trade Commission (established 1914) the Light-house Board, the Fish Commission, the Coast and Geodetic Survey, the Bureau of Standards and the reports of consular officials and of customs and revenue officials belong to this department. See COAST-SURVEY, FISH-CULTURE and NAVIGATION LAWS.

The Department of Labor. The purpose of this department is to promote the welfare of wage earners, to improve their working conditions and advance their opportunities for employment. Among other things, it deals with naturalization and immigration and through its Children's Bureau with the welfare of children. See IMMIGRATION BUREAU.

The Department of Justice. The attorney-general presides over this department and conducts suits for the United States. This department is distinct from the supreme court.

United States Names and Meanings.

NAME	ORIGIN AND MEANING	POPULAR NAME
Alabama	Indian name of a river meaning Here We Rest	Cotton State.
Arkansas	Indian name of a tribe meaning They Who Went down the River	
California	Spanish for Hot Furnace	Bear State.
Colorado	Spanish for colored or red	Golden State.
Connecticut	Indian name meaning The Long River	Centennial State.
Delaware	English name of a nobleman	Nutmeg State.
Florida	Spanish word meaning Flowery	Diamond State (or Little Blue Hen).
Georgia	Latin form meaning Land of (King) George	Everglade State.
		Empire State of the South or Goober State.
Idaho	Indian name meaning Mountain-Gem	Gem of the Mountains.
Illinois	Indian name of a tribe, meaning The Men	Prairie State
Indiana	Latin form, meaning Land of Indians	Hoosier State.
Iowa	Indian name of a tribe and a river	Hawkeye State. (There was an Indian chief named Hawkeye).

Name	Origin and Meaning	Popular Name
Kansas	Indian; from *kansa*, meaning Swift and Wind. It also is said to mean Smoky Water	Sunflower State.
Kentucky	Indian word meaning The Barrens and Prairie	Bluegrass State.
Louisiana	Latin form meaning Land of (King) Louis	Creole, Pelican or Canebrake State.
Maine	French name of a province; or English "main," to distinguish the mainland from the islands	
Maryland	English name for the queen of Charles I of England	Pinetree State.
Massachusetts	Indian name meaning Place of Great Hills	Old-Line State.
Michigan	Indian name meaning the Great Lake	Bay State.
Minnesota	Indian name meaning Sky-colored Water	Peninsular or Wolverine State.
		Bread and Butter, or Gopher, or North Star State.
Mississippi	Indian name meaning Father of Waters or Great River	Bayou State.
Missouri	Indian name meaning The Big Muddy	Bullion State.
Montana	Spanish for mountain	Mountain or Treasure State.
Nebraska	Indian name meaning Shallow Water or Water Valley	Tree-Planter State.
Nevada	Spanish for snow-covered	Sage-Brush or Sage-Hen State
New Hampshire	English name for a county in England	Granite State.
New Jersey	English name of an island in the English Channel	Garden State.
New York	English name of a city in England and of a duchy	Empire State.
North Carolina	Latin form meaning Country of (King) Charles	Old North, or Tarheel, or Turpentine State.
North Dakota	Indian name of tribes meaning Allies	Flickertail State.
Ohio	Indian name meaning The Beautiful River	Buckeye State.
Oklahoma	Indian name meaning Land of the Fair God	
Oregon		Beaver or Sunset State.
Pennsylvania	Latin form meaning Penn's Woodland	Keystone State.
Rhode Island	Dutch name meaning Red Island	Little Rhody.
South Carolina	See North Carolina	Palmetto State.
South Dakota	See North Dakota	Coyote or Sunshine State.
Tennessee	Indian name meaning The River of the Big Bend	Big Bend or Volunteer State.
Texas	Indian name of tribes meaning Confederates	Lone Star State.
Utah	Indian name of a tribe	Salt Lake State.
Vermont	French name meaning Green Mountains	Green Mountain State.
Virginia	Latin form meaning Virgin's Land, for Queen Elizabeth	Old Dominion State.
Washington	English and American name of a family	Corner or Evergreen State.
West Virginia	See Virginia	Panhandle State.
Wisconsin	Indian name meaning The Wild, Rushing River	Badger State.
Wyoming	Indian name meaning Great Plains	Equality State.

Alaska is an Inuit word meaning The Great Land; Arizona an Indian name that signifies The Place of Small Springs; Hawaii a Polynesian title; Mexico, as in New Mexico, is from the Aztec name of *Mexitl*, the Mexican war-god; Panama is an Indian or Spanish name; Philippines is a Latinized Spanish form meaning Land of (King) Philip (of Spain), Filipino meaning an inhabitant of the Philippines; and Porto Rico is a Spanish term meaning Rich Port.

United States Steel Cor'pora'tion. This corporation is the world's greatest combination of capital. It was organized under the laws of New Jersey in March, 1901, being formed from ten large corporations, each of which was itself a consolidation of several smaller companies. Its total capitalization is $1,404,000,000, or nearly half of all the money in the United States; it represents one sixty-seventh of the total wealth of the United States in 1900. The corporation, when founded, exercised direct and positive control over 213 manufacturing and transporting plants and companies and over 41 mines in 18 states. One hundred of the manufacturing plants were in Pennsylvania, 51 in Ohio, 15 in Illinois, 12 in Indiana, 12 in New York and the rest scattered from Connecticut to California. Its mines furnished more than half of the total production of iron-ore in the United States, four fifths of the bessemer steel and two thirds of the steel rails. It controlled 1,000 miles of railroads and a lake-fleet of 112 vessels, one third of the tonnage on the northern lakes. By "community of ownership" it controlled the anthracite fields of Pennsylvania, thousands of miles of railroads and an ocean steamship line. It has rapidly increased its holdings. The company controls steel interests in America. Our steel exports in 1900 were valued at $130,000,000. Manufacturers of other countries look upon this concentration of interests as a strengthening of American exporting capacity.

U'niver'sity, a higher educational institution, having the right to give degrees in several departments of learning and with a body of teachers or faculty in each of the different schools or colleges connected with it. The modern university, dating back to the 12th or 13th century, is thought to be the outgrowth of the schools connected with the convents and monasteries throughout Europe. When some popular teacher, as Abelard or Peter Lombard, drew crowds of students, these usually formed themselves into a corporation to which was given the name of *universitas*. Some of the early universities, as that of Paris, were formed by a body of teachers, while others, as Bologna, were corporations of students. The faculties of a university are the teachers in particular departments, as the faculty of law, faculty of arts etc. The two highest officers of a university have usually been the rector and chancellor. A degree is given by the university when a student has passed through a certain part of the course of study. The degree of doctor or master at first entitled the person who received it to teach in the university giving the degree. Pope Nicholas I near the end of the 13th

century granted the University of Paris the right to endow its graduates with the power to teach anywhere. The degree of bachelor, borrowed from the terms used in knighthood and indicating an imperfect or partial graduate, that is, one who had finished only the lowest stage of university work, was first introduced at the University of Paris in the 13th century. The colleges, as the different schools connected with a university are called, at first were mere boarding-halls, which were later appropriated to the faculties of different departments.

Europe has about 100 universities, the oldest being the University of Paris, which was organized in the 12th century but was not called a university until the 13th century. It had two chancellors, and gave degrees, those of doctor and master at first being the same, but afterward the degree of master was given to those who were qualified to teach the arts and that of doctor to those who could teach theology, law or medicine. The Sorbonne (*q.v.*) was the theological school of this university, which was suppressed by the convention in 1793, but was revived by Napoleon I as the University of France, which has charge of all public instruction. The "Academy" of Paris has five faculties: law, medicine, theology, science and letters. It usually has 4,000 students. The University of Bologna, with its charter given by Frederick Barbarossa in 1158, was especially celebrated for its law-schools; and that of Salerno, of the 12th century, for its instruction in medicine. Women were admitted to both, and graduates of Salerno practiced as "lady physicians" in the 12th and 13th centuries. Italy has twenty-one universities; Germany twenty-one; England ten; Ireland two; Scotland four; and there are about thirty in all the other countries of Europe. The oldest universities in Germany are Heidelberg, Leipsic, Tübingen, Jena and Halle. The German universities are governed by the professors, presided over by a rector or chancellor. There are three grades of professors, called ordinary professors, extraordinary professors and *privats-docent*. The ordinary professors are the highest class, and are elected by the government from candidates chosen by the faculty, and give lectures on the subject which they are selected to teach. The extraordinary professors have smaller salaries, and can lecture on any subject they please, as may also the *privat-docent*. The student attends any lectures he chooses, but cannot practice any profession without a certain course of university study. Göttingen University, founded in 1734 by Baron Munchausen under the auspices of George II, king of England and elector of Hannover, was one of the most famous in Europe, having over 3,000 students until that at Berlin was founded in 1810. The University of Tübingen, dating back to 1478, with seven faculties, is noted as having once been the seat of what is called the Tübingen school of theology. The Universities of Berlin and Bonn are among the most prominent in Germany, that at Berlin having about 6,570 students and 471 professors. Heidelberg University has a professorship of English literature, established in 1873, the first of the kind in Germany. The German universities are under the control of the government, and most of them are dependent upon state appropriations. The universities of Switzerland, Holland, Belgium, Russia and Austria are on the German model. That of Prague, founded in 1348, is the oldest in central Europe. Louvain, founded in 1425, was once very famous, as was also the University of Leyden, founded by William of Orange. Spain has nine universities, and Portugal one. The University of Salamanca, established in 1415, had at one time 10,000 students and 28 colleges. The oldest Scandinavian university is at Upsala in Sweden, and there is one at Christiana in Norway, with another at Copenhagen in Denmark.

Of the four English universities, Oxford and Cambridge are the oldest, dating back to the 13th century. Those of Durham and London are modern, being founded in the 19th century. The University of London has no colleges directly connected with it, but confers degrees, upon examination, to students of nearly all the institutions of learning in the country. Oxford has twenty-three colleges and Cambridge eighteen. This college system distinguishes the universities of England from those of the continent. A student must connect himself with a college before he becomes a member of the university. The teaching in these colleges is done almost entirely by tutors, and the professors of the university only deliver lectures on special subjects once or twice a week. Degrees are dependent upon examinations, and fellowships are provided, by means of which promising students can continue their advanced studies for years. The Scottish universities are at Edinburgh, Glasgow, Aberdeen and St. Andrews, that of St. Andrews being the oldest. They were patterned more after the German universities than those of England. The students were divided into four nations, named from the parts of Scotland from which they came. The University of Edinburgh has but one college, but this has all the powers of a university. The University of Dublin has only one college, Trinity College, but several faculties, including those of oriental and modern languages, mining and civil engineering. Queen's University has three colleges, at Belfast, Cork and Galway, each called Queen's College, and the governing body

of the university holds its meetings at Dublin.

In the United States, the term university is loosely applied to many institutions which strictly are only colleges, just as the term college includes many academies and high schools. In its strictest sense it is limited to institutions having several schools, as those of law, theology arts etc., in addition to the regular college course, where graduate work is carried on, that is, work done in the higher branches after graduation in a college. Harvard University, the oldest and one of the best-equipped of our colleges, is at Cambridge near Boston. It includes Harvard College, the Divinity School, Law School, Lawrence Scientific School, the Graduate School, Medical School, Dental School, School of Business Administration, Schools of Architecture and Landscape Architecture, Bussey Institution (a school of Agriculture), Arnold Arboretum, the University Library, Museum of Comparative Zoology, Peabody Museum of American Archaeology, the University Museum, Botanic Garden, Gray Herbarium, and the Astronomical Observatory. Radcliffe College for women is also a part of Harvard. The finest building is Memorial Hall, built in honor of the alumni who fell in the Civil War.

Yale University, known as Yale College until 1887, is at New Haven, Conn., and takes rank with Harvard as one of the best institutions in the country. It was founded in 1701, and in 1901 celebrated its bicentennial. It includes, besides the college or academical course, schools of law, theology, medicine, philosophy and arts. The school of fine arts, with its gallery of Italian pictures, and the Trumbull collection of 54 pictures, the Peabody Museum, the Sheffield Scientific School buildings, Marquand chapel, Osborn hall, Vanderbilt hall, the bicentennial buildings of 1901 and the library are among the noticeable structures. There are 377 instructors and about 3,282 students. Johns Hopkins University, founded in 1876, at Baltimore, Md., resembles the German universities in its methods. The work is largely graduate work, and the teaching is mainly by lectures. It was endowed by Johns Hopkins with a fund of $3,500,000. Higher mathematics and history are among the subjects in which special work is done. Clark University, at Worcester, Mass., founded in 1888, is an institution for graduate work only.

The state institutions are all called universities, but only in a few is the university system fully developed. The University of Michigan, at Ann Arbor, is one of the largest, with about 300 instructors, and over 5,000 students. It has departments of law and medicine. Chicago University, though opening only in 1892, already ranks among the great universities of the country. Its courses are so arranged that students can be admitted at any time, as there is instruction during the whole year. It has 334 instructors, selected from the best institutions in America and in Europe, and 3,035 students. Many institutions of learning bearing the name of university in the United States are founded and carried on by the different religious denominations, as the Wesleyan Universities at Delaware, O., and Middletown, Conn., and De Pauw University at Green Castle, Ind., all under the direction of the Methodists; while Brown University at Providence, R. I., belongs to the Baptist denomination, as do the University of Rochester and Dennison University. Most of the universities, both of Europe and of the United States, are mentioned under the name of the place where they are situated, but a full account of the numerous institutions called universities has not been attempted. See articles under titles as above and COLLEGES.

University Exten'sion, a branch of educational work of English origin, whose object is to extend the advantages of higher education to the people at large. The university center organizes lecture courses along lines likely to be popular with the surrounding population, especially in such subjects as literature, economics, art, history and science, and sends out, upon request, a lecturer, usually one of its own professors, to give a series of lectures at intervals of one week or two weeks in some one general field. The success of these lectures depends largely upon the ability of the lecturer to adapt his matter to the interests and capacity of his audience.

The best university extension centers use various means in addition to the lectures to enhance results. Syllabi of the courses, with references for home reading, are often given, and selections of books known as travelling libraries loaned by the university. Discussions and questions at the close of the lecture or special classes for discussion give a vital touch to the subject, and enable the lecturer to drive home the main principles and explain obscure points. In some instances local examinations are held at the close of the series of lectures, and university credit given. A small fee is usually charged for lectures.

University of California, one of the largest and most important state universities in America, is situated at Berkeley, Cal., on San Francisco Bay. The view over the bay is strikingly beautiful. In addition to the buildings at Berkeley, which include an open air auditorium, built in the Greek style and with a seating capacity of 7,500, the University maintains the Lick Observatory on Mt. Hamilton; a University farm at Davisville, Yolo County, where practical agriculture and related sciences are taught; a laboratory of plant pathology at Whitten and a marine biological laboratory near San Diego. Its usefulness is greatly broadened

by a department of university extension, and an institute of medical research founded in 1913. The growth of the university has been very rapid. In athletics a system of football has been developed which, it is asserted, is more scientific than the Rugby and safer than the American game. It is a result of study and experiment and has been carefully worked out.

University of Chicago, The, at Chicago, Ill., is the successor to a Baptist University of Chicago (1857-86) whose graduates are considered alumni of the present institution. The old college showed the interest of Chicago, from its youth, in higher education, and it did good work. When it died, Mr. John D. Rockefeller (*q. v.*) suggested to the American Baptist Educational Society that it be revived. Mr. Rockefeller himself contributed the greater part of the endowment, having in all given the new institution $23,924,322. Marshall Field (*q. v.*), S. A. Kent, Martin A. Ryerson, Miss Helen Culver, Mrs. Emmons Blaine and many other Chicagoans have donated over $3,000,000 more. Mr. Charles Yerkes contributed $300,000 for the erection of the university's observatory at Lake Geneva, Wis., and for placing the largest telescope in the world in it. The result was the organization of Chicago university. It was chartered in 1890, Dr. William R. Harper (*q. v.*) was called from Yale Divinity School to become its president, and teaching began on Oct. 1, 1892. The president and two thirds of the trustees must be Baptists, but the university is nondenominational as well as coëducational.

The university, in its organization, enjoyed every advantage that American ability and aspiration, the fullest educational experience and knowledge and the command of enormous financial resources could give. It was therefore planned on the broadest lines and with a special view to growth and change in the future, so that it shall, as far as men can foresee, adapt itself in every way to the demands of modern life as they arise. It therefore emphasized graduate study and research work; established study in summer as well as in autumn, winter and spring, thus adding 25% to the working year; gave an important place to university extension (*q. v.*); founded a system of affiliated colleges and schools whose students have special privileges in the university; and employed so large a corps of teachers that classes can be kept small, however many the students, and each individual receive personal attention. The university is organized into the five departments of schools, colleges and academies; university extension; libraries, laboratories and museums; the press; and affiliated schools. The first department includes schools of divinity, education, law, medicine and science, to which are to be added schools of fine arts, music and technology; colleges of arts, of commerce and administration, of literature, of science and University College; and numerous affiliated academies or preparatory schools. The divinity school includes five theological seminaries. The medical school has Rush Medical College affiliated with it. The commercial college teaches banking, journalism, trade and industry and transportation. University College is designed chiefly for teachers, and is conducted in the center of Chicago (*q. v.*) by the university. The university's extension offers courses by correspondence and lectures in the same subjects as the university itself, and the student who completes courses in the extension receives credit as a student in the university, which by means of this department comes into touch with the people and with public education.

The courses continue 12 weeks or six, each requiring four or five hours a week in the class. Teachers and others outside the university attend largely in summer, and every year more and more students themselves attend them. A few students reside in the houses of their societies, about a third in dormitories on the campus, but the greater part elsewhere in the city or in suburbs.

The grounds and buildings occupy a tract at 59th street (Midway Plaisance), between Jackson and Washington Parks, about seven miles from the heart of the city. The buildings, which are beautiful and very numerous, are in the English Gothic style of architecture, and grouped impressively on a plan of quadrangles. There are now 334 instructors and over 3,000 students. The requirements for admission are as severe as those of any American college or university, and the standard of scholarship is high. Consequently the university stands in the front rank of American schools of higher learning. The libraries number 461,385 volumes, exclusive of 170,000 pamphlets. In 1907 the productive funds were $12,974,211; the receipts from benefactions $5,926,989; and the income $1,222,353.

University of Colorado, a state institution, is at Boulder, and was first opened in 1877. Its organization comprises a college of liberal arts, school of applied science, school of medicine, school of law, college of dental surgery and school of music. It also provides graduate courses. It is open to students of both sexes. The faculty numbers 168, the students 1,300, including the preparatory school. The library has 40,000 volumes. See COLORADO.

University of Illinois, at Urbana, Ill., was founded by the state upon the donation by the national government of scrip for 480,000 acres of land. On account of this

grant the state pays the university interest at the rate of five per cent. on about $415,000. The university was incorporated as Pharos Industrial University, and was opened to students in 1866. In 1865 the legislature changed the name to University of Illinois. It includes the college of literature and arts, college of engineering, college of science, college of agriculture, preparatory school, school of fine arts, school of music, college of law, college of medicine and school of pharmacy. The value of its property and assets is estimated at $1,600,000. It has 100 instructors, 1,200 students and 100,000 volumes in its library. See Illinois.

University of Kansas, at Lawrence, was established by an act of legislature in 1864, and is an integral part of the public-school system. The university embraces a graduate school, school of arts, schools of engineering, law, fine arts, medicine and pharmacy. The faculty numbers 140, the students 1,300, and the library 35,000 volumes. See Kansas.

University of Michigan, The, was chartered in 1837, and began work in 1841 at Ann Arbor. It is a part of Michigan's system of public education and is controlled by regents elected by the people for eight-year terms. The university includes the departments of art, literature and science, engineering, law, medicine and surgery, pharmacy, the homeopathic medical college and dental surgery. The courses in each department cover each branch of collegiate, professional or university study. The departments of art, literature and science, medicine and law also hold sessions in summer. The standard of scholarship is exceptionally high, and Michigan has long stood in the front of universities. It was a pioneer in coeducation, admitting women in 1870. It has many valuable collections and libraries, two observatories, two hospitals and two gymnasiums. The faculties number 221 instructors, the students 3,300, and the libraries 225,000 volumes. In 1897 the income, including the appropriation from the state, was $1,178,267. Students are charged only small fees, those from Michigan paying less than students from other states.

University of Minnesota, at Minneapolis, is a state institution and was first organized in 1851, but dates its actual beginning from its reorganization in 1868. The university comprises the graduate department, college of science, literature and the arts, college of engineering and the mechanic arts, school of mines, college of agriculture, college of law and department of medicine. It also has charge of the experiment-station and the geological and natural history survey. Students of both sexes are admitted, and the total enrollment, exclusive of summer schools, is 3,300. The faculty and instructors number 300. The library has 115,000 volumes. See Minnesota.

University of Notre Dame, two miles from South Bend, Ind., was founded by the Very Rev. Edward Sorin in 1842. It provides courses in the departments of arts and letters, science, architecture, civil, mechanical and electric engineering, law and pharmacy. The faculty number 82, the students 850 and the library 35,000 volumes.

University of Oregon, is at Eugene, 105 miles south of Portland. It is a part of the public-school system. The organization comprises colleges of literature, arts, science and engineering and schools of mines and mining, medicine, law and music. It has 103 instructors, 1,200 students and a library of 20,000 volumes. See Oregon.

University of Vermont and State Agricultural college is located at Burlington. It has a faculty of 70, 513 students and a library of 70,000 volumes. See Vermont.

University of Wisconsin. See Wisconsin, University of.

Upas, a tree belonging to the mulberry family, found in Java. It grows over 100 feet high, with a straight trunk and oval leaves covered with down, and a purple bark. Something like a small, rather long plum. It was long called the deadly upas and believed to be very poisonous, so that all animals going near it were killed, and even other trees and plants — travelers finding it growing solitary in a barren waste with the bones of its victims around it. But, instead, it is found growing in the forests, and animals do not seem to avoid it. Many specimens have been collected without effect and the tree now is in the principal botanical gardens of Europe. Its poison is similar in its effects to the poison-ivy, and is found in the juice of the tree, and used by the natives on the points of their arrows. They also make a cloth from the inner bark of the tree, which, if it gets wet, produces a disagreeable itching. Bags are made from the rough bark of one species of upas. See Poisonous Plants.

Upper Canada College, Toronto, was founded in 1829 by Sir John Colborne (Lord Seaton). It is modelled after the public schools of England. One hundred and fifty resident pupils are comfortably accommodated. It is beautifully located in spacious grounds in Deer Park on a hill at the northern limits of the city. There also is classroom accommodation for 150 day-pupils. The college prepares for university, honor matriculation, for entrance to military schools and medical colleges. It has an infirmary, swimming tank, skating rinks, cricket grounds, etc. Its cadets' rifle-corps is one of its interesting features. It is well-provided with scholarships and prizes. The preparatory school has proved attractive. The Board of Governors has purchased a site

of six hundred acres twenty-five miles from Toronto, and plans for the new buildings involve an expenditure of $600,000.

Upsala or **Uppsala** (*ŭp-sä'lä*), a city in Sweden, on Sala River, 40 miles northeast of Stockholm. It is in a fertile plain with fine buildings and parks. The cathedral, begun in the 13th century, is the most celebrated in Sweden. The university, founded in 1474 and richly endowed by Gustavus Adolphus, has fine buildings, over 70 instructors and 1,835 students. There are also connected with it a botanic garden, a mineralogical collection, a museum and an observatory. Population 24,450.

Ur of the Chaldees, mentioned in *Genesis xi: 27-32* as the point from which the family of Abraham migrated to the west, has been identified with a city of southern Babylon, near the Euphrates. This city was the seat of a dynasty of kings before it fell under the sway of Babylon. Yet there are indications that the home of the family of Abraham was higher up the Euphrates than the city of Ur (the modern Mugheir), so that the identification is not certain. The ruins of Ur at Mugheir still stand; their most conspicuous feature being a temple to *Sin*, the god of the moon.

U'ral Mountains, a part of the boundary between Europe and Asia, separate European Russia from Siberia. The chain is made of a series of parallel ridges in the southern part, running toward the northwest, the highest summit being 4,680 feet. Farther north there are several low ridges, with peaks reaching 5,115 feet, while one low ridge in the extreme north completes the range. The middle part of the range is very rich in minerals, having mines of gold, copper, platinum and iron. Precious stones, as the emerald, beryl, topaz, amethyst and diamond, are also found. The population inhabiting the mountains and supported by the mines is 200,000.

Ural, a river of Russia, separating Europe from Asia. It rises in the Urals, flowing south and southeast for 1,100 miles and emptying into the Caspian. There is very little navigation. Its banks have been fortified by a line of forts, and its fisheries are very valuable.

Ura'nium, a metal first isolated in 1842 from the oxide of uranium, discovered previously by Klapworth. It is found in uranite or pitchblend in Bohemia, Saxony and Cornwall, England, and is prepared by heating a mixture of uranium chloride and sodium chloride with carbon or, preferably, with metallic sodium. It, with its other mineral compounds, possesses a notable radio activity, emitting rays which have a photographic action and make phosphorescent substances luminous.

U'ranus, in Grecian mythology, is sometimes the son, but generally the husband, of Gæa the earth, by whom he became the father of Oceanus, Saturn, the Cyclops and others. He hated all his children, and confined them in Tartarus; but Cronus, at the instance of his mother, overthrew and dethroned him.

Uranus. See PLANETS.

Ur'ban, the name of eight popes, of whom the following deserve special mention:

Urban II, a Frenchman by birth and originally a monk of Cluny, was elected in a council held at Terracina in the year 1088. His name was Otho, and soon after his election he resumed possession of Rome, the fortresses of which had been held by the antipope Guibert, styled Clement III, whom he compelled to withdraw. A great council was held in Piacenza in 1095, in which the antipope and his adherents were excommunicated; and at the same council the crusade was proclaimed. Urban died in 1099, just when the crusade which he had organized was ending in the occupation of Jerusalem.

Urban V (originally William de Grimoard) was the last of the popes who resided at Avignon. By him the papal seat was retransferred to Rome. He was elected pope on the death of Innocent VI in 1362 and died in 1370, leaving the reputation of great piety and of zeal for religion and good morals.

Urban VI, whose name was Bartolommeo Prignani, was the pope under whom the great western schism had its origin. On the death of Gregory XI in 1378, Prignani was elected in a conclave held at Rome in circumstances of great excitement, owing to the apprehensions of the populace that a French pope would be elected and Rome again abandoned. Prignani was crowned under the title of Urban VI, but immediately afterwards 12 French cardinals assembled at Anagni and revoked his election, declaring that they had voted for him under fear of violence. They were joined by three Italian cardinals, and then proceeded to elect the cardinal-bishop of Cambray pope under the title of Clement VII. Clement took up his residence at Avignon, but Urban remained at Rome, where he appointed a number of new cardinals and excommunicated Clement and his adherents. The result was that Urban was recognized as lawful pope by one portion of the church and Clement by the other, each maintaining his claim by extreme measures. Urban was besieged by Charles, king of Naples, at Novara, whence he withdrew to Genoa, taking with him as prisoners those cardinals of his party with whom he had quarreled, several of whom he is said to have put to death. He died in 1389 from injuries sustained in a fall from his horse.

Urban VIII, the successor of Gregory XV, whose family name was Maffeo Barberini, was born at Florence in 1568. After

many years of service in various capacities, he was elected pope in September of 1623. His memory has suffered through the imputation of nepotism; but his pontificate on the whole was vigorous and enlightened. He was the founder of the celebrated College of the Propaganda, and to him Rome is indebted for many public works, including large and important additions to the Vatican library. His pontificate was also distinguished by the acquisition of the duchy of Urbino to the Holy See in 1626. He died in 1644, and was succeeded by Innocent X.

Urban'a, Ill., county-seat of Champaign County, is noted as the seat of the University (*q.v.*) of Illinois. There also are a good system of public schools, a high school and two libraries. Urbana's most important industrial establishments are the "Big Four" car-shops, employing 700 men, next the brick-works and then the lawn-mower and machine works. Population 8,245.

Urbino (*ŏŏr-bē'nō*), in central Italy, is situated between the Metauro and Foglia Rivers, 20 miles southwest of Pesaro. It has a magnificent palace, once the residence of the dukes of Urbino, where was the famous library of the Della Rovere family, afterwards removed to the Vatican. Another handsome palace is that of the Albini, a family who gave the church Pope Clement XI. Urbino is the birthplace of Raphael, and became a part of the kingdom of Italy in 1860. It is the seat of a free university founded in 1564. Population of Pesaro and Urbino 25,103.

U'rim and Thum'mim, a mysterious contrivance on the breastplate of the Jewish high-priest, either consisting of the four rows of precious stones upon which the names of the 12 tribes were engraved or of two images personifying — most probably — Truth and Revelation. Others assert that the words personified by these images were Light and Perfection, and still others that they were Doctrine and Judgment. The consulting of the Urim and Thummim as an oracle was a very solemn ceremony with the Jews, but it is never mentioned after Solomon's time.

Ur'sa Ma'jor. See BEAR, GREATER AND LESSER.

Ursa Mi'nor. See BEAR, GREATER AND LESSER.

Ur'sula, St., a female saint and martyr, especially honored in Germany and Cologne, the place of her reputed martyrdom, who is variously assigned to the third, the fourth and the fifth century. According to the legend, she was the daughter of Deonatus, a British king, and on account of her beauty was sought in marriage by the son of a pagan prince. Fearing that she might bring ruin upon her father by a refusal, she consented to marry the prince, but made it a condition that she should be allowed three years, during which she proposed to make a pious pilgrimage in company with her ten maidens, each being accompanied by a thousand other maidens, making 11,000 in all. The maidens were collected from all parts of the world, and the expedition set sail from the British coast. Arriving at the mouth of the Rhine, they sailed up the river to Cologne and thence to Basel. Leaving their galleys, they proceeded by land to visit the tombs of the apostles at Rome. This pilgrimage accomplished, they returned down the river to Cologne, which had meanwhile fallen into the hands of an army of Huns under the leadership of a chief, who, although not named, plainly is the Attila of history. Landing at Cologne in ignorant security, the pious virgins fell into the hands of these barbarians, by whom all were seized and put to death. A host of angel warriors, however, interposed and smote the cruel Huns; and in gratitude to their martyred intercessors the citizens erected a church on the site now occupied by the Church of St. Ursula.

Ur'sulines, a religious order of women in the Roman Catholic church, taking their name from Saint Ursula. They derive their origin from Angela Merici, who, early in the 16th century, formed at Brescia an association of young women who fully devoted themselves to the care of the sick, the instruction of children and the relief of the poor. In 1565 a house was opened at Cremona, and the order spread over several dioceses in Italy. Soon afterwards it was established in France, where one of its members was the celebrated Madeline St. Beuve. It was in France that the sisters added to their vows the instruction of female children, which has since formed the most marked characteristic of their order.

Uruguay (*ōō'rŏō-gwī'*), the smallest of the South American republics, is 53 times the size of Rhode Island, the smallest state of the Union, and nearly equal to the combined area of Ohio and Indiana. It lies between Brazil on the north and northeast and the Argentine Republic on the west, with the Atlantic Ocean on the south and southeast. Its greatest length and breadth are a little over 300 miles each, the total area being 72,210 square miles. Brazil, the largest of the South American countries, is 43 times the size of Uruguay. Uruguay is considerably further east than the eastern limit of the United States, being directly south of Newfoundland. Its population is 1,112,000.

Surface and Climate. Uruguay is a country of hills and plains, with no elevations exceeding 2,000 feet. In the south the country is a sort of terraced upland, with a treeless coast possessing some good harbors. Rio de la Plata, a broad deep estuary,

and Uruguay River, with their tributaries, furnish easy and ample water-communication with the interior. There are 1,273 miles of railways, 4,916 of telegraph, 11,414 of telephone and 5,340 of roads. The climate is mild and on the coast is equable, but in the interior is subject to sudden changes. The rainfall is abundant, averaging 40 inches annually; it is heaviest on the coast.

Resources. The wealth of the country consists mainly in its pasturage, which supports large herds of cattle, horses and sheep, the wool of Uruguayan sheep being of superior quality. The latest record reports 9,000,000 cattle; 20,000,000 sheep; 1,000,000 horses; and 60,000 mules. The value of exports in 1911 was $47,380,000. Agriculture is growing in importance, wheat and corn being the chief crops; flaxseed, barley and oats are also raised. Of manufacturing establishments the most important are packing-houses, flour-mills, furniture, cigar and carriage and wagon factories.

Government. The president is elected by a general assembly; his term is four years and he is not eligible for a succeeding term The general assembly consists of two houses, a senate and a chamber of representatives. A vice-president presides over the senate The republic is divided into 19 departments, the chief executive of each being appointed by the president.

Cities. The chief cities are Montevideo, the capital and chief port, population 291,465; Paysandu (12,000), a port on Uruguay River; Salto (14,000); Mercedes (10,000); and San José (9,000).

Education and Religion. Primary education is obligatory. In 1906 there were 619 public and 289 private schools. The first had 1,218 teachers and 57,638 pupils; the second, 289 and 17,242 respectively. In 1907 it was arranged that 150 public schools be added. At Montevideo are an university, a preparatory school and an institute of experimental hygiene. In 1905 the university had 112 professors, 530 regular students and 661 secondary pupils. There also are a military college, many religious seminaries, normal schools and a state school of arts and trades. But half of the population over six years old is illiterate. Roman Catholicism is the state religion, but there is complete toleration.

History. Uruguay was discovered by Solis of Spain in 1515, and colonized by Sebastian Cabot in 1527. The Indians, however, successfully resisted Spanish attempts at settlement until 1624, when the oldest city was founded. Spain and Portugal quarreled over the possession of Uruguay, and the Brazilians and Argentines continued the quarrel until 1828. In 1811 the Spanish in Uruguay, whose ancestors had from 1726 colonized Montevideo from Buenos Aires, threw off the yoke of Spain, and the settlements formed a confederation. The Brazilians in 1822 made it a province of Brazil, but in 1828 united with Argentina to make Uruguay an independent republic. For 80 years, however, it has suffered almost incessantly from internal discords. Consult the Bureau of American Republics' bulletins and *Handbook of Uruguay* and Cattell's *Foreign Commercial Guide.* See AMERICA (SOUTH), ARGENTINE REPUBLIC, BRAZIL and PARAGUAY.

Uruguay, a river of South America, rises in southern Brazil. It flows westward a little less than 100 miles, and then southward, forming a boundary line between the Argentine Republic on the west and Brazil and Uruguay on the east. It unites with the Paraná to form the Plata in 34° S. latitude, its total length being about 1,000 miles. Its chief branch is the Rio Negro.

Urumiah (*ōō'rōō-mē'ȧ*), a town of Persia (*q. v.*), ten miles west of Lake Urumiah, in a wide and fertile plain, is surrounded with a mud-wall but has no gates. Extensive fruit and vegetable gardens are situated both within and without the walls. The houses of the richer classes are lofty and spacious, and many of those of the poor are adorned with flowers and vines. The city is the seat of a Nestorian bishop and of an American Presbyterian mission, which is in a very prosperous condition. The city is said to have been the birthplace of Zoroaster (*q. v.*), founder of the religion of ancient Persia, and has a population of 30,000.

Urumiah, the principal lake of Persia, is about 4,000 feet above the level of the sea, and nowhere exceeds 20 or 25 feet in depth. It is about 80 miles in length, with an average width of about 25 miles. Its waters are largely impregnated with salt, and are so heavy as to be little ruffled by the strongest wind. No fish are found in it, although several rivers empty into the lake. Its average depth is only about 12 feet, and it is fast drying up, leaving a gradually widening beach of salty crust, which supplies the whole of Kurdistan with salt.

U'sury. This word originally meant anything charged by the lender of money for the use of it; but it now refers to any charge above the legal rate. In most, if not all, civilized nations there are laws limiting the rate which lenders of money may charge for its use, with greater or lesser penalties for all charges which go above this limit. In the United States the laws of the states vary somewhat in this respect, although in all of them a legal rate is established for cases where there is no express contract — six per cent. in nearly all the states — and another limit prescribed — generally eight or ten per cent. — within which contracts may be made by

the parties, and beyond which contracts are rendered void or at least cannot be enforced by law.

Utah (named from the Ute Indians), a western state of the Union, a trifle larger than Idaho; area 84,970 square miles; breadth 275 miles; extreme length 345. It is bounded on the north by Idaho and Wyoming, on the south by Arizona, on the west by Nevada and on the east by Wyoming and Colorado. The state, which ranks eighth in size, was first settled by the Mormons in 1847, and by them called Deseret. It occupies an elevated plateau, at an average altitude of 5,000 feet, from which mountain-peaks rise 11,000 to over 13,000 feet, with correspondingly deep valleys. The Wasatch range forms its chief topographical feature in the northern and middle regions, with the notable water-basin of Great Salt Lake northeast of the Great American Desert and north of Utah Lake. The population of the state in 1900 was 276,749, but it has now nearly doubled being 438,974. Its capital is Salt Lake City (92,777). The other chief towns are Ogden (25,580); Provo City (8,925); and Logan (7,522).

Surface and Drainage. Besides the high, central Wasatch range, with its eastward spurs known as the Uintah Mountains, there are many other elevations southeast and west. The chief ones are Needle, Wah-Wah, Beaver River, Fairview, Henry, Deep Creek, Abajo, La Salle, Thomas, Desert, Terrace and Goose Mountains. From these ranges soar lofty peaks, as Mts Peale and Gilbert and Emmons, Wilson, Hodges, Tokewanna and Lovenia Peaks, each of which exceeds 13,000 feet in height. The lake and river drainage also is considerable and varied, embracing (besides Great Salt Lake, 2,500 square miles in extent) Lake Utah and Bear and Sevier Lakes and Green, Grand, Colorado, Snake, Bear, Sevier, Virginia, Jordan and San Juan Rivers. In San Juan County, in the uninhabited and almost inaccessible southeast, are the greatest natural bridges in the world. Emery Knowles discovered them in 1895. They number three. Augusta Bridge is 265 feet in height, 55 in width, 85 in thickness and 320 in span; Caroline 150, 90 and 330 feet respectively; and Edwin 111, 50, 10 and 205. This is the slenderest and most graceful bridge. Each consists of light sandstone. The mountains around rise 11,000 to 13,000 feet.

Resources, Mining and Agriculture. The natural resources consist of the yield from minerals and from agricultural operations almost entirely. The annual production of wheat amounts to 5,708,000 bushels; of oats to 2,494,000 bushels; of corn to 504,000 bushels in 1902; of beet sugar to nearly 50,000 tons. The area annually devoted to crops is 1,368,211 acres, embracing hay and forage, besides the cereals named. The minerals include coal, of which over 2,500,000 tons are mined; copper, the yield of which is now over 125,000,000 pounds; silver 10,445,000 ounces ($5,040,800); gold $4,311,700 (the yield being 208,687 ounces); and lead, 57,081 short tons. Other mined products embrace clay, salt, iron, bismuth, iron, cement and building-stone. The annual wool-product amounts to 4,504,500 pounds. Utah has over 1,800,000 sheep, 75,500 dairy cows, 336,324 neat cattle and 117,953 horses and mules.

Manufactures. There has been considerable progress in the development of manufactures in recent years. The number of industrial establishments is now about 750, employing some $11,800,000 of capital and turning out products to the aggregate value of $21,980,000. The two principal industrial centers are Salt Lake City and Ogden, the leading industries throughout the state being the smelting and refining of copper and lead ore, flour and grist-mill products, engineering work, railway repairing, printing and publishing, confectionery manufacture, cheese and butter making, the preserving and canning of fruits, vegetables and condensed milk, together with foundry and machine output, the brewing of malt-liquors and cattle-slaughtering and meat-packing.

Commerce, Finance and Transportation. The railway mileage of the state is 1,085 miles, the more important lines being the Rio Grande Western, the Oregon Short Line, the Central Pacific, the Los Angeles and the Union Pacific. There are eight short lines also. The expenses of the state are met by a property tax, which includes mines and mining property. There are now 21 national and 56 state banks. Brigham Young organized the first national bank in 1873.

Education. The school-system is under a board, aided by a state and a county superintendent. Education is free, as are the text-books. Education from 8 to 16 is compulsory. Illiteracy is only 5% of the population, and half of the 6,141 illiterates are foreign-born. From a school population of about 105,000 the annual enrollment is 81,721; while the average daily attendance is 69,140. Normal schools for the training of teachers are maintained at Salt Lake City in connection with the state University of Utah and also at Cedar City. Higher education is represented by the University of Utah, which has 115 instructors and 810 students; by Brigham Young College at Logan (Latter Day Saints), with 32 instructors and 704 students; and by Westminster College (Free) at Salt Lake City; there also is an agricultural college at Logan. The state university is co-educational, and, besides its normal-school department, has a school of mines and a school of arts and sciences.

History. Though the first settlement of note was made in 1847 at Salt Lake City by Mormons under Brigham Young, who were driven out of Nauvoo, Ill., the region (organized as a territory in 1850 and admitted to statehood in 1896) has an early history. This includes the visit of Spanish explorers in or about 1540 and the exploration of Colorado River. Seeking a route from Santa Fé to Los Angeles and the Pacific, two Franciscan friars in 1776 visited Utah and Sevier Lakes, where trading and hunting parties were afterwards organized. In 1824 Great Salt Lake was discovered by Capt. Jas. Bridger, a trapper, who was seeking to trace the course of Bear River. Posts were established later, which were welcome to immigrants passing through the territory to Oregon and California, as also to the bands of traders and hunters who now began to operate in the region. Among these posts was Fort Ashley, built in 1825 and for a time occupied by an expedition under William Ashley. Later expeditions were those under Capt. Bonneville and John C. Frémont, the report of the latter, it is related, being instrumental in inducing the Mormons to come, though the Mexican War was in progress. Following the band of 150 Mormons that arrived in 1847 with Brigham Young, there came others to the colony at Salt Lake City, the region meanwhile having passed (1848) from Mexico to the United States. Under the Mormon Church the state of Deseret, as it was called, was organized in 1849, while appeals were made to Congress for admission into the Union. This was refused, though the federal executive in 1850–1 created the territory of Utah and appointed Brigham Young as governor. For six years Young held office, the Mormon colony being considerably added to by proselytes and new arrivals while he was governor, though the region began to be populated by non-Mormons. Between the two sets of colonists there arose opposition, while trouble also came from the territorial officers sent by the federal government, who were opposed and interfered with the rule of the Mormon Church, tenacious of its power and hold upon the region. In 1857 such were the difficulties that arose from the rival control of affairs, which more than once manifested itself in violence and attempts at mob-rule, that the federal authorities determined to supersede Young in the governorship, and for that purpose and to subdue disaffection sent troops to Salt Lake City, deposed Young and appointed a new governor. The outbreak of the Civil War for a time diverted federal vigilance over matters in the territory, but soon antipolygamy legislation arose and ere long dealt drastically with Mormonism. Immigration of an anti-Mormon character helped to neutralize the rule of the church, while the Edmunds bill of 1882, following other expedients of a legislative character, disfranchised all polygamists and abolished many of the officers in the territory and with them the corporation of the Mormon Church, while the property of Mormons was escheated. So threatening and adverse to the church and its organizations was the aspect of affairs, that in 1890 President Woodruff, the head of the church, was necessitated to issue an ordinance discountenancing polygamy,—a timely action which met the approval of a general conference of the Mormon Church. Polygamy, nevertheless, continued for a time further to be practiced, and the taint of it so affected at least one senator from the state that he was not allowed to take his seat. In the case of another senator the national senate took action to inquire into the prevalence or existence of polygamy since 1890; but whatever there was, as time passed, was neutralized, kept in abeyance and finally stamped out by local prejudice against it among the anti-Mormon element in the state, while the rise and influence of political parties on national lines were effective in expunging the obnoxious practice and clearing the state of the immoral taint. The constitution given the state in 1895, just a year before the admission of Utah to statehood, forbade polygamy. In 1905 settlement was extended by the opening of the Uinta Indians' reservation. The organization of the Mormon Church or Latter Day Saints, as they are called, continues to exist, though division has entered into their ranks and made two folds of them — one the Utah branch with 700 ministers, 796 churches and about 300,000 members, and the other, a Reorganized Branch, with headquarters at Lamoni, Iowa, which numbers about 50,000 with 860 active ministers. Consult Jones' *Utah* and Bancroft's *The Pacific States.* See MORMONS.

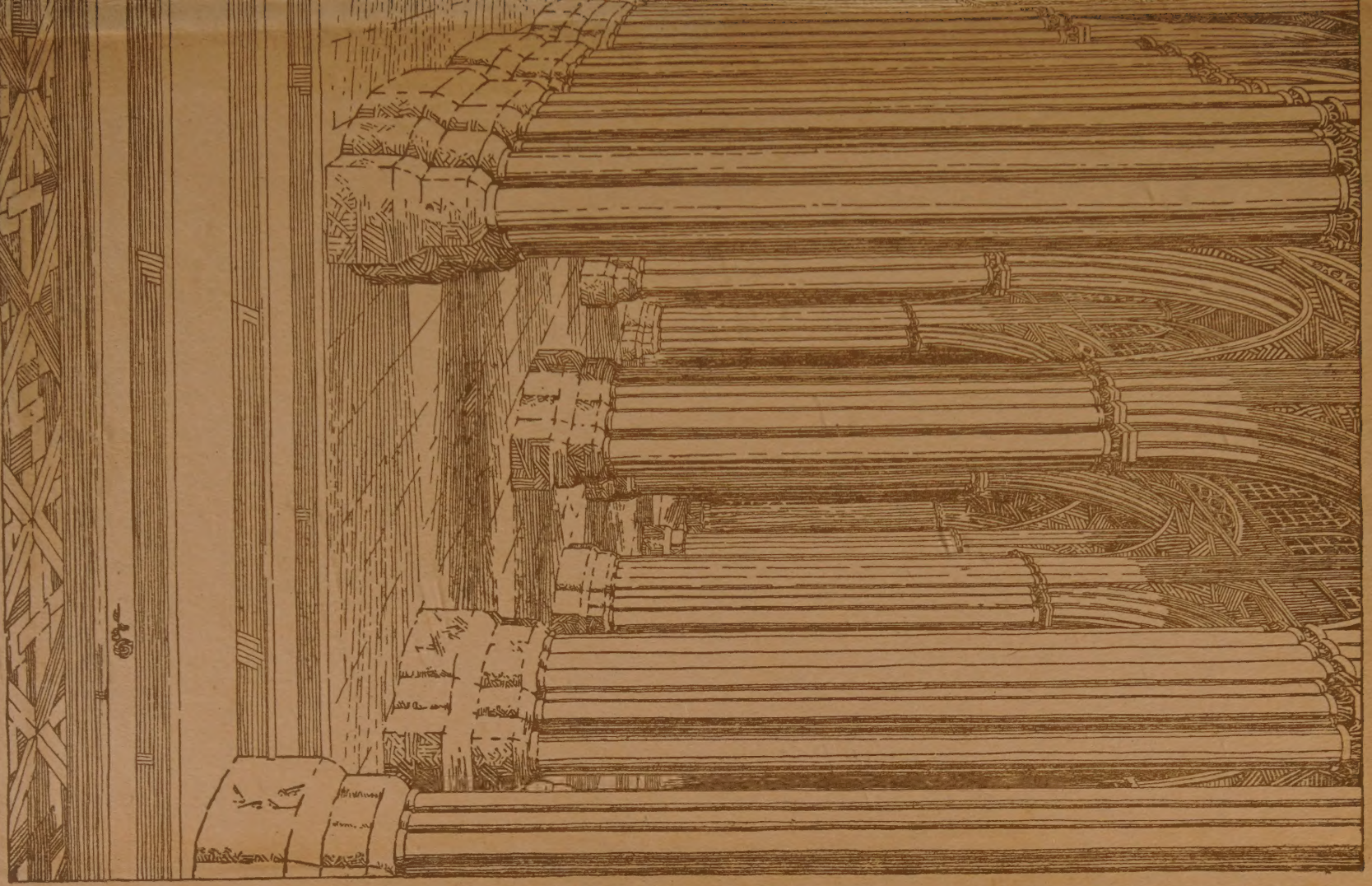
Utahs or **Utes,** a tribe of Indians formerly roaming over Utah, Colorado and New Mexico, but now occupying reservations in Utah and Colorado. Their number is about 5,000.

U'tica, an ancient city of Africa, near the Bay of Carthage and a short distance from the site of the modern city of Tunis. The Tyrians are said to have founded it 287 years before Carthage was built. It was an ally of Carthage in her early wars with Rome. But in the third Punic War Utica early made separate submission to Rome, and, when Carthage fell, was rewarded with a part of her territory. The Roman governor made his residence there. In the accounts of the struggles between Sulla and Marius and between Cæsar and Pompey it is often referred to as an important city. It had an amphitheater, which would seat 20,000 people, and an artificial lake or

which mimic sea-battles were fought. Its water-supplies were stored in many immense cisterns, some of which are 136 feet long, 19 wide and 20 or 30 deep. Augustus made it a free city. The Vandals conquered it in 439, then the Byzantine emperors recovered and held it till the 8th century, when the Arabs conquered and destroyed it.

Utica, N. Y., county-seat of Oneida County, on Mohawk River, 95 miles from Albany and 52 miles from Syracuse. The city is regularly and handsomely built, and rises from the south bank of the river to an elevation of 150 feet. One of the state hospitals for the insane is here, with a number of other benevolent and charitable institutions. The manufactures amount to several millions annually, and comprise a great variety of products. The annual cost of maintaining the public schools is $220,000; the number of teachers employed is 300; and there are 12,000 pupils enrolled. At the Revolutionary War Utica was a frontier trading-post, and also was the site of Fort Schuyler, built to guard a settlement against the French and Indians. Population 74,419.

Uto'pia is the name given by Sir Thomas More to the imaginary island which he makes the scene of his work, entitled *Utopia* (from Greek words meaning nowhere), first published in Latin in 1516 and translated into English by Bishop Burnet. This island, which More represents as having been discovered by a companion of Amerigo Vespucci, is the abode of a happy society, free from all the cares, anxieties and miseries of mankind. In this community all property belonged to the government, no private ownership being allowed; and the wants of all persons were supplied from the common stock. More's work, which is still published, attained a great popularity, and the epithet Utopian is still applied to all plans for the improvement of society that are deemed visionary and impracticable. A counterpart to More's work is found in a production of the present day, entitled *Looking Backward*, by the late Edward Bellamy. See COMMUNISM, MORE and SOCIALISM.

Utrecht (*ū'trĕkt*), a city of the Netherlands, capital of the province of Utrecht, is beautifully situated in a district of rich, grassy meadows, extensive orchards, flower-gardens and cultivated fields. It is favorably situated for trade, being the point from which several railroads radiate and having excellent water-communication by way of the old Rhine and the Vecht. Utrecht is one of the oldest cities of the Netherlands, and probably was founded by the Romans. It was here that the union of the northern provinces for the defense of their political and religious freedom against the tyranny of Spain was formed on Jan. 23, 1579. It is the seat of an university. Population 118,386.

Utrecht, Treaty of. The treaty or treaties of peace concluded in 1713 between France and the allied powers — England, Austria etc. — after the ten years' war relating to the Spanish succession. Consult Macaulay's essay reviewing Lord Mahon's *History of the War of the Succession in Spain.*